THE

ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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THE WOOLWICH LOAN.

THE agenda paper of the London County Council for Tuesday, December 17th, contained a long report from the Finance Committee to the Council with regard to the application for a loan of £40,000 by the Woolwich Metropolitan Borough Council.

Set out briefly, the facts are as follows: In March of this year Woolwich applied for £36,570 to extend its electricity undertaking in order to meet further demands. In view of the unsatisfactory results of the undertaking, the County Council suggested that Woolwich should obtain expert advice on the undertaking generally. This was done, and the advice received was to abandon one of the two existing generating stations, viz., Plumstead, to extend the Globe Lane station, and to increase the loan application from the figures given above to £50,000, when, on the basis of carefully prepared estimates, it appeared that the present loss of £16,000 per annum would be reduced to about £9,561. Further consultations resulted in a reduction of the proposed capital expenditure from £50,000 to £40,000 by removing some of the plant from the station to be abandoned at Plumstead, and fixing this plant at Globe Lane, *the cost of removal being charged to revenue*—the revenue, as noted above, being £16,000 deficit (or as actually printed in the latest return issued by the statistical officer of the L.C.C., £16,813, aggregating since the undertaking has been in the hands of the Borough Council a deficit of £106,318). The consulting engineer also considered the question of taking a partial bulk supply, which would have involved a capital expenditure of £16,330, upon which the L.C.C. Finance Committee made the comment, "even if the Borough Council's estimates are fully realised, as to which there is considerable doubt, the scheme proposed is only slightly more favourable than the partial bulk supply scheme, while it has the great disadvantage of involving much larger capital expenditure." The Borough Council, however, definitely declined to adopt the partial bulk supply scheme.

The only redeeming feature about the whole business is the undoubted increase of output, which must be met to enable Woolwich to meet its obligations in the matter of electricity supply—obligations as to keeping down the rates are, of course, a secondary consideration now that the elections are over. After dealing with the question of certain outstanding loans on the machinery to be abandoned, and the early repayment thereof, the L.C.C. Finance Committee said: "We do not feel that the County Council can in this case decline to sanction the application," and therefore appended a form of recommendation that a substantial amount on account be sanctioned, which was duly agreed to.

Evidently the whole matter has been very carefully looked into; the very great and grave cause for regret is the sad financial position in which municipal mismanagement has engulfed this enterprise—in a district, curiously enough, where some of the largest and most prosperous electrical manu-

facturers have their works. It will be remembered that the Borough Council purchased the Globe Lane Works from the Woolwich District Electric Light Co. in 1903 for £79,700, some 10 years after the establishment of the works by the company, which had paid a dividend of 5 per cent. in 1900 and of 6 per cent. in 1901, so that the business has now been in existence for some 19 years, involving during the last nine years losses, as stated above, which total £106,318, with a present annual loss of £16,813. We search in vain amongst the statistical columns of a contemporary, whose every sentiment is in favour of municipal ownership, to see the Woolwich figures. The name does not appear with the other metropolitan undertakings owned by Local Authorities; its absence naturally gives rise to the question, Why? Information, however, is provided in abundance in the complete return dated 1910-11 issued by the County Council, from which we have previously quoted. Here it is seen that the units sold for the year amounted to 2,889,022, with a load factor of 26·79, the highest figure under the latter heading in London except one. With such figures again a question forces itself upon us: Why the disastrous results? It is at all times a pleasure to us to know that electrical enterprise is expanding, that output is increasing, and that means must, of necessity, be found to meet the demands of new consumers, but we have never hesitated to condemn such a profligate policy as is here set forth. We acquiesce in the advice tendered by the Finance Committee of the County Council to limit further capital expenditure, and purchase the additional energy required in bulk; this would give time to reflect and opportunity to reform some weaknesses of the system which have led to the existing drain on the ratepayers, but whilst "system" that is unsound continues, it is a practical impossibility for an engineering scheme, no matter how good, to succeed, and we cannot help doubting the wisdom of the County Council's decision to lend the money without availing itself of its option to refer the question to the Local Government Board, who would hold an inquiry in open Court, and afford the Woolwich ratepayers an opportunity of expressing their views.

The whole matter brings to our mind the words of Maud Muller—

> For of all sad words of tongue or pen,
> The saddest are these: "It might have been."

To which *Truth* added a further stanza—

> Far sadder still are some things I've seen,
> Which are but never ought to have been.

THE PREVENTION OF CORRUPTION ACT.

We have before us "News Sheet No. 25" of the Secret Commissions and Bribery Prevention League, giving counsel's opinion on certain cases submitted by the Society.

The first case is that of a quite independent third party introducing buyer and seller and receiving a commission on the transaction. It is a relief to find that counsel's opinion is that such a commission is legitimate. But why counsel's opinion should be necessary on such a point we cannot imagine. The second case submitted is that of a wholesaler delivering goods to a shipper and sending him two invoices—one a "show-er and the other a blower," as the Irishman said about his two pocket-handkerchiefs.

The "shower" indicates a small cash discount which the shipper allows to his customer abroad.

The "blower" shows the real trade discounts, and is the basis for the shipper's cheque. Some one is evidently itching to say that this is illegal, but he contents himself by saying that if the shipper proved to be in a fiduciary capacity to the actual buyer abroad, and were pocketing a secret discount in addition to what his principal allowed, he would render himself liable under the Act. With that, of course, we entirely agree; but we do not agree that the wholesaler is concerned to inquire whether the shipper, who is actually his customer, occupies such a fiduciary position or not. We should suppose that if he asked any such question he might expect to be told to mind his own business.

Other cases include that of a builder who claims trade discount on ironmongery supplied to him to fix by the owner, to whom, of course, he is not in a fiduciary position. A separate commission note to a merchant is questioned, apparently on the sole ground that it is not to be disclosed to the actual foreign purchaser.

Counsel's opinion is clear, that the whole essence of the question is that of the relationship between the intermediary and the final buyer. Are they as defined by the Act, principal and agent? Counsel says it would be for the Court to decide whether the wholesaler knew, or ought to have known, that such a relationship existed, before giving his two invoices or his commission note. We confess that we are rather surprised that these elementary questions are occupying the energies of the Society and its advisers. They would be wiser to leave alone the ordinary and everyday transactions of commerce, when absolutely free from corruption.

We gather from the Press that they are intervening on the subject of tradesmen's corrupt Christmas boxes to domestic servants, by issuing declaration forms, to be signed by both servant and tradesman, which, no doubt, they will sign with perfect composure. But we are still awaiting the onslaught of the Society upon those larger offenders who, while chiefly in the service of the public bodies, continue to extort large quantities of blackmail on every possible occasion, and to ruin those who refuse it, by means of the "club clauses" in their iniquitous contracts; while they regard the Act as one of the best cloaks ever bestowed upon hypocrisy to cover sin.

Neither the Act nor the Society appears to have any effective machinery for "finding out," and that is the weak point. The result is that the Society, by fussing over trumpery offences, and calling in question such perfectly legitimate, regular and almost universal commercial operations as those referred to, still further lowers the effective force of the Act for any practical good.

India Paper: An Example.

The first India paper copy of the *Transactions* of the American Society of Civil Engineers has arrived. It contains 1,230 pages, and, with a considerable number of folded plates on thicker paper, can be pinched down to $\frac{7}{8}$ in. thickness between thumb and finger. If the Americans do this, why not ourselves? All our Institutions and Societies use respectably thick paper, and annually fill many feet of bookshelves that would be better occupied by India paper volumes.

The paper used is such that 50 leaves go to $\frac{1}{16}$th in., or 800 to the inch. This is a fairly thin quality, yet it is quite sufficiently opaque for comfortable reading. The sheets of the folding plates are heavier. The innovation is most commendable, as possessors of the thin edition of the "Encyclopædia Britannica" must have found.

For engineers, who are so nomadic, the use of thin-paper editions is truly valuable, if a man requires to carry any of his library with him.

THE COMMERCIAL DEVELOPMENT OF ELECTRICITY SUPPLY.

V.—The Joint Publicity Committee.

The purpose of the publication of these articles is to assist in the arousing of the electric supply industry to a proper sense of the urgent need for reform in business methods, and the establishment of future development on thoroughly sound and practical lines. Individual authorities are at present blindly groping for a solution of the problem from various standpoints, and throughout the industry there is a general feeling of helplessness and inability to grapple with the situation. The vital importance of the subject is apparent from the fact that it is being dealt with in various ways by the entire electrical Press, and honest endeavours of this nature for the betterment of the industry should at least be recognised as such.

In the opening remarks of the first article of this series brief mention was made of the operations of the Electric Supply Publicity Committee, and while due acknowledgment was made to those gentlemen of the executive who have so generously given their services gratuitously to the work of the Committee, it was pointed out that the formation of a far more effective organisation was imperative to meet the immediate and growing requirements of the electricity supply industry. We have reason for believing that the opinion thus expressed is endorsed in the main in many quarters, and in any case we contend that the remarks are fair comment and of general interest. Anxious as we are to support by all means in our power the furtherance of the interests of electricity supply, it would be absurd for us to disparage any well-intentioned effort to that end, but it is realised that the Electric Supply Publicity Committee's activities are not sufficiently effective or convincing. In taking a broad view of the whole situation, it was intended to confine our remarks on this subject to the passing reference in the first article, but as a letter in the nature of a protest has since appeared in our "Correspondence" columns from Mr. Cramb, who holds the position of vice-chairman of the Committee, a return to the subject has become to a certain extent necessary.

Dealing with the constitution of the Committee, it is admitted that the gentlemen composing the executive hold high administrative positions on important electric supply undertakings, and are undoubtedly well versed in the duties of their respective offices, but it is logical to conclude that such duties absorb practically the whole of their available time and energies, leaving but a small margin for devoting to the emancipation of their brethren who are struggling with the difficulties of efficient organisation. The letter of protest above mentioned commences with the inference that contributors to the electrical Press on the subject of commercial development are ignorant of essential conditions. This is hardly fair or courteous, as it must be evident to the members of the Committee, and the industry generally, that at least equal knowledge of the subject is possessed by many men actively engaged in administrative duties, but who have not assisted at the deliberations of the Electric Supply Publicity Committee.

It is hardly reassuring to those whose support is invited to learn that the Committee which professes to be in a position to perfect the organisation of others, has not been able to complete its own internal organisation. It is understood that a complete scheme was drawn up at the inception of the Committee, but the difficulties met with must have been very real, and practically insurmountable, as they have prevented all but the pamphleteering section being put into operation. This being the net result of nearly three years of organisation, it would be interesting to estimate in how many years, at the present sectional rate of progress, the advantages of the complete scheme will be available to the electric supply industry generally.

Returning to the constitution of the Committee, from whatever cause, the fact remains that the General Committee is comprised, with few exceptions, of gentlemen whose interests are identified with the fortunes of London and suburban undertakings, and one of the chief obstacles to the operation of the Committee's complete scheme appears to be the prevention by Government auditors of financial contributions by London boroughs. This being so, why does not the Committee devote its energies to the disposal of difficulties on home ground? Unless such difficulties are dealt with in a practical manner, it will become increasingly difficult for the Committee to convince the industry that the solicitude for the general welfare is sincere, as already provincial authorities do not feel assured that their interests can be adequately served by the Committee.

If a really valuable comprehensive scheme has been formulated in the past, it surely would not suffer by being brought into the open, but, on the other hand, if approved by supply authorities and other bodies whose interests are allied, it might result in the acquisition of the support so ardently solicited. As matters stand at present, the procedure of the Committee is very similar to asking a man to buy a pig in a poke, and by continuing to hide the light under a bushel, the Committee calls upon its collective head sarcastic comment, cheap and otherwise, which the vice-chairman so strongly resents. Honest criticism exerts considerable influence for good, although from constant reiteration it may appear "sheep-like" to the irritated recipient.

Borrowing this simile, and quoting further from the letter in question, a "bleat" will be noted in regard to the refractory conduct of manufacturers. It is stated that as they have not subscribed literally to the funds of the Committee, they have not realised their responsibilities. By this it is assumed that these responsibilities actually exist, but manufacturers will no doubt contend that in this view their intelligence is computed at a very low estimate. Generally speaking, they are shrewd business men, whose profits are cut fine in the face of keen competition, and who are beset by many harassing details. Until convinced that concrete benefit will result, they cannot be reasonably expected to commit themselves to liberal subscriptions to the funds of the Electric Supply Committee. Their support is also contingent on the publication of the complete propaganda, and at present they are not rushing in where supply angels fear to tread.

The intimate connection between the interests of manufacturers and contractors is also an important point to consider when discussing the question of contributions. The latter community is not yet in a peaceful frame of mind in regard to the designs of a section of the electric supply industry upon its business, and until a definite understanding has been arrived at, a co-operative policy will be difficult to formulate. Both manufacturers and contractors fully realise that measures adopted for promoting an extended use of current must benefit them materially, and, given assurance that honest co-operation was fully intended, both bodies would undoubtedly welcome, and liberally support, an organisation in a position to put a scheme into practice.

With regard to gas interests, the Vice-Chairman of the Committee falls into the "sheeplike" error of repeating the fallacy that gas companies have been driven to combine by realisation that they are fighting for existence. By the attraction of their attention to the puny efforts of the Electric Supply Publicity Committee, the gas companies realised that their immense resources placed them in a very favourable position to organise a thoroughly powerful association which would consolidate their strength. The wise counsels which are brought to bear in the administration of gas companies have taken the precaution of preventing, as far as possible, the weakening of their strong position, and their descent to the penurious condition common to many electric supply undertakings.

Smug self-satisfaction is the bane of electricity supply, and, unless the present significant warnings are heeded, may prove the undoing of many. The satisfaction of members of the Electric Supply Publicity Committee should be tempered with the realisation that in their trifling with the organisation problem they have raised a Frankenstein in the Commercial Gas Association, and, unless they realise the gravity of the situation, the support which they are in a position to give to the electricity supply industry in combatting the activities of the monster will be as serviceable as a pea-shooter in the hands of a man opposed to an adversary armed with a Mauser pistol. The vaunted increase of business may become a vanishing

quantity when the forces of the Commercial Gas Association are equipped to carry the war permanently into the competitive camp. In the course of another "bleat" a line of argument is put forward which will not appeal very forcibly to business men. In effect, criticism of the methods of the Committee is unwarranted until, having been provided with sufficient funds, the Committee has been unable to give value for the money. The position of authorities who have handed over money which most can ill-afford, would, therefore, be similar to that of the man who is granted the privilege of locking the stable door from which his horse has been stolen. On the evidence of the vice-chairman, the Committee apparently wishes to work on autocratic lines, and it yet remains to be proved that such an attitude commends itself to the industry generally. It is fully realised, by those who, in spite of opinion to the contrary, are not ignorant of essential conditions, that the formulation of a complete scheme involving the co-ordination of existing forces is not an easy matter, and it is also equally realised that the existing organisation of the Electric Supply Publicity Committee does not inspire hope that such a scheme will materialise in the immediate future. The Committee cannot accomplish impossibilities, and no one of the many critics would be idiotic enough to expect it to do so. To expect the Committee to spend huge sums on advertising, and to do many other things which can only be carried out when a proper technical staff is at command, would be absurd.

To sum up the situation it must be admitted that the Committee, after nearly three years' existence, has not even the lukewarm support of the industry. The position might have been greatly improved had the Committee openly stated the details of the complete scheme, and given the industry an opportunity of estimating the value of its proposals. Confidence begets confidence. As professional pamphleteers, the members of the Committee have attained a certain degree of proficiency, but even present supporters would, no doubt, excuse some cessation of activity in this direction if a start were made on another section.

Even if a complete scheme were formulated in the past, there is no guarantee that such a scheme would be of a suitable nature to meet the requirements of the present time and of the immediate future. The characteristics of electricity supply are now rapidly varying, and only those who have closely studied the commercial situation from an expert point of view are in a position to shape the policy of future development. Emphasis must, therefore, be given to our previous assertion that spare time and intermittent effort is merely wasting valuable time, and wearying to those who are anxiously looking for real assistance. The industry generally appreciates the fact that the problem can only satisfactorily be dealt with by the application of permanent and unremitting expert ability.

The Publicity Committee excuse their lack of progress on the ground that, owing to the withholding of financial support, it has been impossible to establish the necessary expert technical staff. Potential subscribers contend that the non-existence of such a staff precludes the possibility of receiving value for their money. Thus a deadlock has arisen, and a satisfactory settlement appears to be no nearer accomplishment as the years pass. Speculation naturally arises in the mind of the average supply man as to whether this position is to be maintained indefinitely, and the internal difficulties of the Committee are to be allowed to retard the progress of the whole industry. The adherence to a Micawber-like policy at the present critical juncture will, no doubt, have a serious effect on future expansion, and it is difficult to satisfactorily account for the complacent attitude of the Committee in the light of recent events.

What is really needed, and will become an accomplished fact, perhaps without the acquiescence of the Committee, unless that body rises to the occasion, is an association with a permanent staff selected from those possessing the highest expert commercial organising ability in the electric supply world. An association so equipped would be eagerly welcomed and assured of adequate financial support. Its practical utility for the serious work to be coped with would engender the confidence of supply authorities and others whose interests are concerned. Even pamphleteering under expert guidance would be materially improved, and the general smoothing of the rough commercial path of the harassed supply engineer would be gratefully appreciated. Compilation of statistics should be an important branch of the work of a real development association. At present a custom prevails among municipal managers of circularising their *confrères* for information on various matters and tabulating replies. Although possibly convenient, it is at the best a rather cumbersome proceeding, and often a source of irritation to the recipients of the lists of queries if carried out to any great extent. The existence of a statistical branch to which reference could be made, and from which information could be promptly received, would save much time, labour, and mental stress.

A thoroughly organised development association would also be in a position to act in an advisory capacity on commercial matters generally, and many instances of difficulties similar to the above will readily occur to those who have up to the present been compelled to flounder along unaided. With expert assistance assured, it may be safely assumed that the supply industry would only be too glad to avail itself of the advantages to be obtained by rendering the requisite financial support.

The adoption and recommendation of apparatus, more especially for domestic purposes, is with most supply authorities rather a haphazard proceeding. Manufacturers are more or less working in the dark, and their goods are disposed of more on the strength of the maker's reputation than on practical knowledge of the construction and performances. Selection of the most suitable apparatus may thus prove a tedious and costly process to all concerned, and might well be simplified by the existence of a central body who could undertake the examination and testing of all types of apparatus likely to be of service. In addition to conferring a distinct advantage on the electricity supply industry, the interest of manufacturers would also be served by the pointing out of unsatisfactory details, and the direction of energies into the right channels.

Among other leading duties of a development association should be the education of the supply industry to the importance of exhibition and showroom details, and the proper recognition of an efficient business-getting staff. These matters have up to the present received but scant attention, and are but imperfectly understood. This position is largely due to the fact that in no quarter has authoritative advice been available, and the blind have been turning to the blind for guidance. Although overlooked or disregarded in the past, the right material is in existence for the formulation of at least a nucleus of a really effective development association, and the sooner such material is usefully employed, the better will be the outlook for the welfare of electricity supply. We feel that in continuing to offer the advice "Wake up, Electricity Supply!" we are acting in the best interests of the industry, and at the risk of being deemed monotonous, and in all probability arousing resentment in some quarters, we intend to point out the weakness and disadvantages of the present system. At the same time we do not profess to be in a position to offer a complete panacea for all the existing ailments, as we are of the opinion that the adoption of curative measures must be the result of a consensus of expert opinion, but we are anxious to do all that lies in our power to assist in deliberations to that end, and in taking this stand our advice to the somewhat invertebrate Joint Publicity Committee is: "Get on or get out."

OUR LEGAL QUERY COLUMN.

[*Questions addressed to this column should be written on one side of the paper only.*]

"HAL" asks: "Is it compulsory for a company (running an electricity supply undertaking under provisional orders, granted under the 1882 and 1896 Acts) to comply with the *local building by-laws*, such undertaking not being within the area of the London County Council?"

*** If there are any building by-laws in force in any district outside the metropolis, it is presumed that they will apply equally to all persons and companies in that district. The mere fact that a company is working under the provisions of a private Act will not exempt it from liability to observe those by-laws.

A PLEA FOR THE USE OF HIGH-TENSION CONSTANT CONTINUOUS CURRENTS IN MINES.

By SYDNEY F. WALKER, R.N., M.I.E.E.

It is common knowledge that electricity is used all over the world in mines for lighting and power transmission. It is also well known that in the great majority of mines three-phase alternating current is employed. Further, it is also common knowledge that, owing to the large areas served by each pair of shafts in the case of coal mines, and the great depths and large areas in the case of metalliferous mines, it has become absolutely necessary to employ high-tension, and, in the great majority of cases, extra-high-tension ; 2,000 volts has been employed in mines for a long time, 3,000 volts has also been employed for a number of years, and 6,000 volts is quite common for distribution to groups of mines from a central generating station. The generating stations of large mines, and of groups of mines, compare very favourably in regard to size with those of a great many towns. An installation of 5,000 KW. for a group of mines is quite common, while the power generated at stations supplying mines of various kinds ranges from a figure above 5,000 KW. down to very small figures—under 100 KW.

High-tension, and extra-high-tension, three-phase current has captured the mining field for two reasons. It lends itself so very conveniently to transformation, from higher to lower pressures, and *vice versâ*. In the second place, with the exception of M. Thury's method of using high-tension continuous current, there has been no other system available ; and while M. Thury has been very busy, developing his system, and his works, continually enlarged, have been kept fully employed, no one has apparently taken much interest in it in this country. The present writer raised the question in the discussion upon Mr. Robert Nelson's paper before the Institution of Mining Engineers in 1909, but Mr. Nelson, in reply, appeared to ridicule the idea. Since then a great step has been made towards the attainment of a footing in the United Kingdom for the high-tension continuous-current system, by its adoption by Mr. Highfield, in connection with the Metropolitan Electric Supply Co.'s transmission. The writer understands that the Board of Trade have sanctioned the use of a pressure with high-tension continuous current, by the Metropolitan Co., of 170,000 volts ; and, further, that they have allowed the Metropolitan Co. to use "earth," practically as they choose, for 12 months, in order to carry out necessary experiments. It may, perhaps, be as well to outline briefly, the difference between the method of working by high-tension continuous current, and by three-phase alternating current. With three-phase alternating current, it will be remembered, the generators are connected to the bus-bars in parallel, and the feeders are also connected to the bus-bars in parallel ; and any service that is required, whether for lighting or power, is connected either to the three phases, again in parallel, or between two of them. If no current is being taken for lighting or power, there is an open circuit between all the feeders.

With the high-tension constant-continuous current there is always a closed circuit. The generators are connected in the circuit, in series ; any service that is required, either for lighting or power, has also to be connected in the circuit in series. A generator or a motor that is out of service is short-circuited, and either is put into service by opening the short-circuiting switch.

With the three-phase method of distribution, every effort is made to maintain the pressure as nearly as possible constant at the terminals of lamps and motors taking current from the feeders.

With the high-tension continuous-current system, the strength of the current is maintained as constant as practical working will allow. It is maintained as constant as the pressure is maintained with the three-phase system.

With the three-phase system, if any considerable amount of load is suddenly switched on, the pressure at the bus-bars is lowered, and the engineer in charge of the generating station provides the additional current necessary, either by allowing one or more of the generators to furnish more current, or by running up an additional generator and connecting it to the bus-bars.

In the high-tension continuous-current system, if any considerable load is suddenly thrown into service, the strength of the current passing throughout the circuit is reduced, and the engineer in charge of the generating station takes the necessary steps to add to the pressure, so as to bring the current up to its proper strength. He does so by either increasing the pressure furnished by one or more of the generators already in service or by running up another generator, exciting it, and switching it into the circuit.

The Advantages of the High-Tension Constant Continuous-Current System.

As the writer understands them, the following are some of the advantages of the high-tension continuous-current system, as developed by M. Thury, over the three-phase system.

In the first place, there are two cables everywhere, instead of three. This in itself is a great advantage in mining work. Those who have any experience of mining will appreciate the great importance of keeping everything as simple as possible. Everyone who has had anything to do with making connections to three-phase plant, particularly in the awkward positions in a mine, where sometimes connections have to be made, will appreciate the advantage of the greater simplicity of two cables over three. We do not know, it is probable we never shall know, how many fatal accidents have been caused indirectly, by mistakes in connecting up three-phase apparatus quickly, in a flurry, and with the service alive.

In the second place, it appears to the writer to be a very great advantage that while, with the three-phase system, the full pressure of the service, less, of course, any drop in voltage due to the passage of the current through the conductors on its way to any particular apparatus, is present everywhere, with the high-tension constant continuous-current system, the full pressure between the two cables is only present near the switchboard. As the switchboard is receded from, the difference of pressure between the two cables decreases. In mining work, this again appears to the writer to be a matter of considerable importance, seeing that at the face of the coal, after allowing for all special arrangements for supplying the different districts, the pressure existing between the two conductors of the service, would be comparatively small. Next, it will be remembered that with the three-cored cable almost universally employed with three-phase work, there are six times as many chances of a "short" as there are with the high-tension constant continuous-current service. With a three-core cable there is the possibility of a "short" between any two of the three cables, and between any one of them and the lead sheath or armour. The difference of pressure between either of the conductors and the lead sheath or armour, presuming the neutral to be "earthed," is of course only 58 per cent. of the pressure between any two of the conductors, but as with a 3,000-volt service this means 1,740 volts, the effects of a "short" to the armour are sufficiently disastrous to that core to cause trouble in the other cores and in the cable generally, owing to the heat liberated by the current passing up to the "short," and possibly the arc at the "short."

A point may be noted in connection with this which M. Thury has mentioned. With three-phase parallel working, if a "short" occurs anywhere between two phases, the whole service is put out of gear until the "short" is taken off, and the cable repaired. Even when a short occurs between one core and the armour, it is more than probable that the whole of the service will be temporarily put out of gear, owing to the liberation of heat mentioned above. With the high-tension constant continuous-current system, the only effect of a "short" between the two cables anywhere, is the cutting out of the apparatus previously in service beyond the "short."

Next, there is the question of armouring. The Home Office evidently favours the use of armour very strongly. The present writer has no need again to repeat his objections to the use of armour. He will only mention here that the

Home Office has very wisely decreed that the armour must be "earthed" on the surface; and that it must be maintained absolutely continuous. As readers of what the writer has written upon the above subject will be aware, this is one of his greatest objections to the use of armour. If the armour is "earthed" at the surface, say, and is continuous from the surface to the pit bottom, and thence perhaps along the main roads where falls are not likely; if a fall occurs further in-bye, and the cable is broken, as so frequently happens, it is a matter of very great difficulty to thoroughly repair the armour; so that the conducting earth path by way of the armour, wisely insisted upon by the Home Office, is not easily arranged beyond the break. As he has also pointed out, it is particularly difficult to make the armour good when a break occurs in a three-phase cable. Joint boxes, of course, may be used, but for a joint box to be of any service, for three-phase cables, it must be fairly heavy, and the writer submits, it is not an easy thing even with joint boxes, to keep the armour thoroughly continuous on three-core cables. Their use if frequent, might add seriously to the sheath losses referred to below. On the other hand, with high-tension constant continuous-current working, if the concentric system is adopted, as would be convenient, it would be absolutely necessary that the armour, and the outer conductor, which are virtually one, electrically speaking, should be properly jointed. Unless the outer conductor was properly jointed, the resistance in the circuit would be increased, and if the joint was a very bad one, it might mean a severance of the circuit, so that the whole system was put out of gear for the time.

Some years ago, when the concentric system was developed in connection with parallel working of the medium pressure continuous currents, it was claimed by the eminent firm who had worked it out, and who were exploiting it, that the system prevented, or at any rate, very considerably lessened the possibility of shock. It appears to the present writer that if concentric cables were adopted with the high-tension contant continuous-current system, the chance of shock would be reduced to an absolute minimum, and with a reasonable amount of care in looking after the apparatus, should be practically eliminated.

It should be remembered also that the chances of shock with the high-tension constant continuous-current system, would be considerably lessened in the working of most mines, by the fact that the pressure between the live cable and the return conductor, the outer, would be lessening all the way from the surface to the workings.

Further, it should be perfectly practicable to arrange that it was very difficult, indeed, for anyone to get a shock under conditions similar to those ruling where so many shocks have been received in mines during the last 10 years. It will be remembered that a great number of fatal shocks have been received by men touching metal objects which ought to have been perfectly harmless. Thus, a man taking hold of the haulage rope of a coal-cutting machine, received a shock which killed him, because one of the conductors of the three-cored trailing cable had become connected to the case of the motor. Apparently it had been impossible to protect it by "earthing." With what may be termed very ordinary precautions, with precautions that can easily be taken in every mine, and which every electrician about a mine knows how to arrange, and which many colliery managers know also how to arrange, such an accident as the above should be rendered practically impossible with H.T. constant continuous-current and concentric cables. In another case, it will be remembered, some men received a shock by touching signal wires, which had themselves become connected to the three-phase service. The writer believes he is correct in saying that, in that case, the armour of the three-phase service had become alive, and that the electric signal wires had touched either the live armour, or some other metal which was making contact with the live armour at some other part of the mine. With the high-tension constant continuous-current system, worked with concentric cables, it should be almost impossible for such a case as this to occur.

But when referring to the question of shock, it should not be forgotten that, in mining work, under certain conditions that may easily arise, it has been shown to be practically impossible to guard everyone from the chance of receiving a fatal shock with three-phase currents. Readers of the Electrical Review will doubtless remember the paper read by Mr. W. Wellesley Wood before the Newcastle Section of the I.E.E., upon "Earthed *v.* Insulated Neutrals in Colliery Installations." In the volume of *Transactions* in which the paper is printed, a diagram is given, in which a case is shown where a man actually received a severe shock, fortunately not fatal, but which, under quite ordinary circumstances, might have been fatal, from *touching the case of a three-phase electric motor that was connected to earth.*

As will be seen from the diagram, particular care had been taken to efficiently "earth" the motor, and strictly in accordance with the new Home Office Rules. The motor was connected by means of an "earthed" wire to an "earth" on the surface, to which also the neutral of the generator was connected. The liability to shock arose from the fact, to which the writer has frequently called attention in the *Transactions* of the Institute of Mining Engineers and elsewhere, viz., that the strata of a mine vary in their electrical properties. In the mine in question there was a considerable thickness of high-resistance strata between the surface and the coal seam in which the motor in question was fixed. Further, the ground upon which the motor was standing was also of high resistance. Consequently, when a leak to "earth" developed upon one of the cables of the three-phase motor, "earth," or, as the far more expressive American term "ground" would more properly describe it, became alive. Ground in the neighbourhood of the motor was in more or less direct connection with one phase of the supply service; while the case of the motor itself was in direct connection with the "earthed" neutral. Hence, a man standing on the ground, and touching the case, would get a more or less severe shock, depending entirely upon the nature of the ground, and the resistance of the fault.

It may be objected that something of this kind might occur with high-tension continuous currents. The reply is that it is not as likely to occur; and in any case, there are three chances of the conditions arising, necessary for a shock between ground and the motor case, with three-phase working, to one with high-tension continuous-current working.

The Question of Economy.

And behind all this there is the question of economy. There will, of course, be cases where three-phase working may be more economical for special reasons, than high-tension constant continuous current, but a little consideration of the matter will show, the writer believes, that economy is all in favour of the latter. The volumes of *Transactions* of the Institution of Electrical Engineers for some years past, are full of very ably written papers, by men who have taken a great deal of trouble to investigate the sources of loss in distribution cables in towns, in which high-tension alternating currents are employed. Mining work is not town work; but as anyone who has followed mining work and town work closely will know, mining work has copied town work to a very considerable extent. When mine owners were persuaded that switchboards were necessary, the first switchboards that were fixed were designed on exactly the same lines as those that were then in use in town generating stations. In fact, it would not be too much to say, in the writer's opinion, that a good many of the troubles that have arisen in connection with the use of electricity in mines, have been due to the fact that the designers of the mining plant have not appreciated the difference between the conditions ruling in mines and those ruling in towns. There are certain conditions, however, that are common to both. With both town supply services and mining electric power services, the same conditions rule up to a certain point. Where three-phase currents are employed it has become the common practice to use three-core cables in nearly every case, the cables being armoured, with single or double armour, according to the fancy of the engineer. It has been shown very clearly in the papers which have been presented to the Institution of Electrical Engineers by Mr. Mordey, Mr. M. B. Field, Mr. Miles Walker, and others, that there are several important sources of loss, wherever alternating currents are employed. There is the well-known transformer loss. The writer is mentioning that first,

because it is the smallest source of loss in the great majority of mines. It is the common practice to take the 2,000 or 3,000 volts directly from the service to the motors driving haulage, fans and pumps, where the power is above a certain figure; and in those cases there are no losses due to the transformer magnetisation currents. In all groups of mines, however, there are a certain number of transformers, it is so convenient to transform down to some low pressure for a particular service, and the transformer losses may be in some cases at least appreciable.

There are the more important losses, however, in the cables themselves; the loss due to dielectric hysteresis, and the loss due to the currents generated in the sheaths and armour of the cable, and to the magnetisations and demagnetisations of the armour. Mr. M. B. Field, in a paper read before the Institution of Electrical Engineers, estimated that the loss in the sheath of a three-core cable, having circular cores, each 0·275 in. radius, with distance between the cores of 0·8 in., and a mean radius of sheath of 1·05 in., a thickness of lead sheath of 0·188 in., with a current per core of 200 amperes, and a frequency of 60 periods, was 0·67 KW. per mile with a lead sheath only, and 8 KW. per mile with steel armour.

Taking a mine with 5 miles of cables, and a distribution by means of three-phase alternating current at 3,000 volts, the writer estimates that the combined losses in the sheath of the cables by dielectric hysteresis, and by magnetising currents, &c., in transformers, might easily be in the neighbourhood of 500,000 B. of T. units per annum.

And this, unfortunately, is not the whole story. The above represent the losses which cannot possibly be got rid of. As everyone who has gone into the matter of working with alternating current knows, the actual losses are nearly always very much greater than those that would occur if every precaution were taken to reduce them. The charging currents for the dielectrics of the cables have to be provided by the generators, though in some cases they go to assist the exciting currents of the same generators. The power factor of a mine service as a whole is usually fairly low. In mining work, in fact, the idea usually is to keep things working. It is necessary that that idea should be uppermost. Any loss in output would be serious. But when continuous working is ensured, the questions arise, Cannot economies be obtained? Is it not possible to work the thing cheaper? Electricity is produced in generating stations in mines, in the majority of cases at a very low figure, but it is quite easy to practically raise the cost of generation, by throwing away a large portion of the current that is generated; and that the writer maintains is done to some extent under the very best conditions with three-phase alternating current, and to a very much larger extent in the great majority of cases. The conditions in mining work, in connection with the use of electricity, are very much the same to- day, as they were in the early days when steam was applied to mining. No one thought then of economising in the use of steam; no one thinks now of economising in the use of current generated.

The Question of Complication in the Switchboards.

There are a number of other points the writer would like to have dealt with, had the space been placed at his disposal. He will only now mention in conclusion that the bug-bear, as it appears to him, of the supposed complication in switching, &c., with high-tension constant continuous currents, will be found literally to be a bug-bear, and, like many other difficulties, will be found to be easily overcome when it is faced. If anyone will take the trouble to go into the question of the switches necessary in the generating station, and at the different points where power is used, with three-phase alternating currents, and with high-tension constant continuous currents, he will find, the writer believes, that the latter has slightly the advantage in the matter of simplicity. It is claimed by M. Thury also that it has great advantages in the working of motors, in the avoidance of loss in useless resistances. It has the undoubted advantage that the speed of motors can be regulated easily, and within wide limits, and with as many steps as may be desired.

There are many other advantages in the writer's opinion, which he has not space to detail.

ELECTRICAL WORK IN CANADA.

During the past year electrical developments in Canada have been many and various, and constantly from all parts of the Dominion records of new schemes and extensions are being received. We are indebted for the particulars given in the following notes to the *Electrical News*, Toronto.

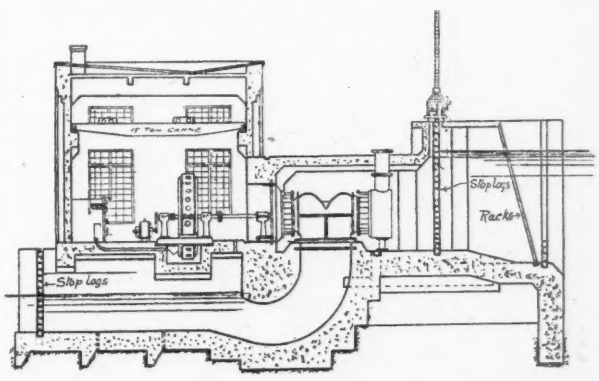
As with ourselves, the street-lighting problem is in a period of evolution, and in many of the towns the principal streets are being well equipped with ornamental standards carrying incandescent lamps or flame arcs. The main shopping centres in Vancouver are now almost entirely provided with ornamental cast-iron standards spaced from 85 to 100 ft. apart and carrying, generally, five 75 or 100-watt tungsten lamps each in an opalescent globe. By the close of the present year it is expected that some 800 standards will be in use, serving about 7½ miles of street.

In a number of streets the benefiting property-owners paid the whole of the installation costs, and are providing 75 per cent. of the cost of current, the remaining 25 per cent. being met by the City Council.

The lighting service is at 110-220 volts three-wire, and for the main streets the service leads are brought down the poles in nearby lanes, and run thence, through fibre conduit in some cases, and sherardised conduit in others, along the sidewalks to the standards. For any future underground work, however, it has been decided to use steel armoured cable, as being less costly in labour and material, and as likely to obviate many of the minor troubles common to the usual conduit system.

Two systems of lighting are in use, one consisting of 11·3-volt, 6·6-ampere tungsten lamps in series, with automatic cut-outs, and the other employing standard 110-volt lamps.

An arrangement has just been made for a trial of G.E. ornamental luminous (flame) arcs in certain streets, the City Council being always on the look-out for something which may be likely in any way to suit their requirements better.



Section of Generating Station at Magog, Quebec.

At Moose Jaw (Assiniboia) some 50 well-designed 5-light ornamental standards have just been installed. The bases, which are 20 in. square, are cast with inside lugs to take the holding-down bolts. The columns are fluted, and taper from 8 in. diameter above the base to 4 in. diameter at the top. The height from ground to top of top globe is 14 ft. 8 in., from ground to bottom of bottom globe 10 ft., and the upper and lower cross-arm lamp centres are 24 in. and 36 in. respectively.

Whilst for many purposes the five-lamp standard is particularly suitable, the light is not sufficiently strong for wide streets of 80 ft. and over, and in a large number of places luminous (flame) arcs are being adopted therefor. At Edmonton (Alberta) the lighting department, on a careful examination of the conditions, and after visiting many cities in the various provinces, have reached the conclusion that

luminous (flame) arc lighting is the most efficient and best adapted form for the business centre of the city. In the latter city the increase this year in the lighting and power demands has been phenomenal. A new 2,000-KW. steam turbine, by the Willans & Robinson Co., is being installed, and specifications for an additional one of 4,000 KW. are now being issued.

An interesting hydro-electric plant has been inaugurated during the past 12 months at Magog (Quebec). A concrete dam 144 ft. long, 35 ft. high and 45 ft. wide at the base, has been built across the river at a point which gives a 20-ft. head some two miles below the town. Six stop log sections 14 ft. × 15 ft., and two blind sections are provided, and tumble bays break the force of the falling water. To enable the racks to be cleaned and repaired, the gate chamber has two sets of stop logs also.

The present installation consists of two Escher-Wyss water wheels of the twin horizontal type, each of a rated capacity of 850 H.P. at 150 R.P.M., with a guaranteed full load efficiency of 81 per cent. The turbine gates are of the wicket type controlled by Escher-Wyss governors. The regulation is 3 per cent. variation in speed on a 25 per cent. change of load, and 15 per cent. on a 100 per cent. change, on a basis of a fly-wheel effect of 225,000 lb. ft. The generators are of 500 KW. capacity, 2,400 volts, 60 cycles, two-phase, and have a full load efficiency of 94·7 per cent. at 100 per cent. power factor.

The temperature rise is 35° C. for 24 hours' run at full load, and at 25 per cent. overload it will not exceed 50° C.

The stator outside diameter is 14 ft., and the total weight of generator 50,000 lb. The two 50-KW. shunt-wound exciters are driven from the shafts of the generators by silent chain drives, and each is capable of exciting both machines. Double-throw oil switches connect the generators to either of two sets of bus-bars, and the outgoing cables from the latter are protected by Garton Daniels lightning arresters.

The transmission lines are carried on 35-ft. cedar poles, spaced at intervals of 125 ft., and consist of No. 0000 B. & S. bare aluminium wires, 21 in. apart. The entire power house, 70 ft. long × 29 ft. wide, is built of reinforced concrete, and space is left for a third unit when that becomes necessary.

In quite other directions also electricity is playing an increasingly important part in the laying out of Canadian cities, a case in point being the new fire-alarm system recently installed at Port Arthur, on the north shore of Lake Superior.

The equipment includes a four-circuit repeater, 52 alarm boxes, and from 20 to 25 miles of No. 10 double-braided, hard-drawn copper wire. Two battery sets charged by a motor-generator, together with the necessary charging board and circuit panels, are located in the central fire hall, as well as a protector board equipped with lightning arresters and fuses, to protect the magnets of the various station apparatus against damage due to the alarm circuits getting crossed with foreign systems in any way.

The street boxes are of the non-interfering type, and are divided into four circuits covering the entire city. Over each box a red light is placed, rendering location easy at night. An Ideal punch register at the central station automatically records any signal given, and stamps out the number of the box from which the alarm came, on a tape. At the same time this number is also displayed from an indicator over the station gong, as well as being struck out by the tower bell in the belfry over the fire hall. A stop clock is part of the equipment, and by means of it the time of receipt of a call can be recorded. The giving of an alarm is further automatically recorded on the gong and indicators at the two hose houses, and is received on gongs at the pumping station, as well as at the chief's residence. An automatic control releases the horse stall doors at the first blow of the signal from any street box.

The four circuits are entirely separated, but a call from either box is automatically transmitted over the whole system by means of the repeater. The latter is positive and non-interfering in its action, and will allow one call only to be transmitted at a time; no confusion is caused, therefore, by two calls being given practically simultaneously. Either of the boxes would give its four rounds of complete signal.

PROCEEDINGS OF INSTITUTIONS.

A Single-Phase Motor with Pole-Changing Windings.

By J. S. NICHOLSON, B.Sc., A.M.I.E.E., and
B. P. HAIGH, B.Sc., Assoc.M.Inst.C.E.

(Abstract of paper read before the INSTITUTION OF ELECTRICAL ENGINEERS, *London, December 12th,* 1912.)

A NEW type of single-phase commutator motor, recently installed in the James Watt Engineering Laboratories of the University of Glasgow, was brought to the notice of the Institution on the occasion of its recent visit to Scotland. This motor, which is the invention of one of the authors, may be termed a railway motor, although the machine tested is of small size and open construction, suitable for experimental work. The main difference between this type of machine and other commutator motors lies in the use of pole-changing windings, and the first part of the paper deals with the principles involved in the use of such windings in commutator motors.

When the motor has to work over a wide range of speed, and especially when it has to develop a heavy torque when starting, a commutator is necessary to ensure that the bands of armature currents are kept in suitable positions relatively to the flux, so that the useful flux per pole shall be as nearly as possible identical with the total flux produced by the field magnets. This essential principle being common ground for all commutator motors, the new motor shares in many of their characteristic features and limitations. In order to ascertain the proper aim of a pole-changing winding applied to a commutator motor, the authors make a brief comparison between two ordinary motors of equal size, developing equal torques, but differing in their design in the choice of the number of poles.

The stator winding of their motor is shown in fig. 1, which shows how eight or four poles are obtained by means of four coils. When these are coupled in the two pairs, 1, 2, and 3, 4, which may be connected in series, as in fig. 1, *a*, or singly, or in parallel, an eight-pole field is produced, covering nearly five-sixths of the total pole area at uniform density. By reversing the currents in Coils 3

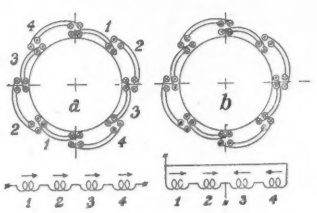


FIG. 1.

and 4, while those in Coils 1 and 2 remain unchanged, as shown in fig. 1, *b*, the directions of the currents in four of the eight groups of slots are such as to fulfil the purpose of an extra main winding, while the directions of the currents in the remaining four groups are such as to neutralise one another.

Comparing the motor with a normal repulsion motor, the authors state that the output of the armature is not greatly reduced by using the shortened-step connections suitable for pole changing. The pole-changing motor is, therefore, not only capable of developing a greater starting torque, but is equally efficient, and on account of the shorter armature end connectors and commutator, is more compact and simpler in construction than the normal design of compensated-repulsion motor.

While the above comparison is applicable in the case of motors of moderate size, suitable for multiple-unit vehicles, it does not apply directly to large-sized locomotive motors. The compensated-series motor, working with a rectangular field-wave and designed with a large number of poles, appears to give better results than the repulsion motor with sinusoidal field, in machines of large size. The pole-changing motor is similarly handicapped by its sinusoidal field, and on account of the distribution of its windings the output is not greatly increased when a rectangular field-wave is used. The output is, therefore, materially less than that of a series motor with the greater number of poles.

The authors describe four methods of controlling a pole-changing motor intended for railway service. Part of the problem lies in making provision for reversing when running with each number of poles, and in each case the motor is reversible and controllable over the full range of speed in both directions. The motor is started as a repulsion motor with the greater number of poles, and after running up to half speed is changed over to the lower number of poles, running as a compensated-repulsion motor excited by a magnetising current in the armature.

The motor installed in the James Watt Engineering Laboratories, which embodies the principles dealt with in the paper, is directly coupled to a small generator which acts as a load. The output of the motor is controlled by regulating the excitation and load resistances of the generator, and is measured by the torque transmitted from the magnet-wheel to the stator of this machine. The stator, which is mounted on ball bearings, carries a graduated arm with a movable weight, and a counterpoise is fitted so that the complete alternator is balanced on its ball bearings when the moving weight is almost at its innermost position. The torque developed is there-

fore proportional to the distance the weight has to be moved outwards in order to effect a balance. The moving weight is fitted with a vernier, and as the alternator is balanced with a slow period of oscillation and has little friction in its ball bearings, it is possible to measure the torque with remarkable exactitude, the error being within one-thousandth part of full load.

The motor tested is one rated at 10 H.P. at 150 volts, 30 cycles, this size being chosen to suit the supply available in the laboratories. The stator-winding is similar to that shown in fig. 1, and is arranged for eight and four poles, so that the speeds

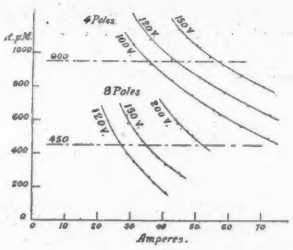


FIG. 2.

corresponding to synchronous running are respectively 450 and 900 R.P.M. The motor was built by Messrs. Mavor & Coulson, Ltd., Glasgow, to the authors' design.

The motor was run with eight poles as a plain repulsion motor and with four poles as a compensated repulsion motor with eight working brushes, connected together in four pairs.

Curves giving the relation between the speed and line current of the machine, supplied at various voltages, are shown in fig. 2. The two sets of curves correspond to eight and four poles respectively, and it will be noted that the working speed ranges are in the neighbourhood of the synchronous speeds of 450 and 900 R.P.M. In fig. 3 the torque (measured in "equivalent horse-power at 1,000 R.P.M.") is plotted as a function of the speed. It will be noted that the curve for 200 volts with eight poles approximately overlaps the curve for 100 volts with four poles, and it follows that if the connections are changed over from one of these ranges

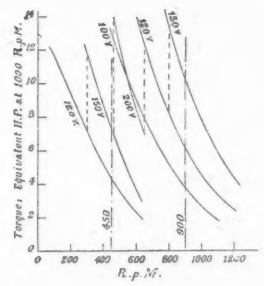


FIG. 3.

to the other, the motor continues to run against any given torque at approximately the same speed, and no mechanical shock is experienced. For lower speeds the eight-pole winding is supplied from transformer tappings giving 120, 150, or 180 volts; while for higher speeds the four-pole connections are used with 120 or 150 volts. The dotted lines indicate the speeds at which the contactors are operated in order to maintain a high and fairly uniform torque during the starting period. These speeds are 300, 460, 650 and 800 R.P.M. During this process the torque varies between 13 and 8 "H.P. at 1,000 R.P.M." A higher average torque may naturally be maintained by changing over at somewhat lower speeds, and in this case the motor is liable to spark slightly when subject to the extra load. This is especially noticeable when changing over to four poles at the lower speeds, and on this account it is preferable to use the 200-volt eight-pole tapping in place of the corresponding 100-volt four-pole connection.

It is not intended to suggest that the pole-changing motor is in general preferable to the compensated-series machine as a traction motor. Where low-frequency current is employed, it appears that the latter machine is simpler and equally satisfactory, as good commutation is obtainable, together with a sufficiently high power-factor to meet practical requirements. When a higher frequency is employed, the repulsion motor in which armature excitation is employed gives a materially higher power-factor than the series machine, and it may be that the pole-changing motor marks a sufficiently great advantage over the normal repulsion motor, as regards commutation, to warrant the use of the higher frequency.

The discussion was opened by DR. S. P. SMITH, who, while appreciating the work carried out by the authors, felt that the motor was not one that would establish itself for single-phase railway work. It was, he thought, impossible to build a plain repulsion motor of the size required for a locomotive, say, of 1,000 to 2,000 H.P., and he felt satisfied that it would not be possible to make a satisfactory machine of the type suggested by the authors of 500 H.P., as they had the added complication of pole changing. Moreover, the motor was tied to synchronism; it gave only two efficient speeds—synchronous and double synchronous. The commutator was introduced to get over the frequency difficulty in the compensated series motor, but it did not effect this in the authors' machine, and he thought it did not carry them any nearer to the desirable single-phase railway motor.

MR. ROGER SMITH said the authors had themselves pointed out almost as many disadvantages as advantages in their design, and left it to the judgment of their hearers. It appeared that the rotor was shorter than that of a corresponding repulsion motor, but any saving in dimensions for railway work should be in diameter, and unless the new motor showed a comparative saving in weight, its advantages would not be many for railway use. He asked whether it was always possible to arrange a smooth change-over from the eight to the four-pole connection. He assumed from the paper that the advantages of this machine only came in at over 25 periods—the highest usual figure for railway work.

MR. W. M. MORDEY suggested that the authors might profitably carry out experiments with their machine, using a fixed rotor and stator, with a view to obtaining the iron loss with a rotating field.

MR. W. E. BURNAND thought the worst feature of the design was the large initial current at starting, which was the trouble with A.C. motors generally. He favoured the straight series machine, but had always found better results from repulsion motors, and he considered that for stationary work, if a motor was used for any length of time, a plain slip-ring motor would give the best result.

MR. HAIGH, in replying, said the difficulty in regard to starting and sparking was the same in all the three motors referred to. The synchronous character of the repulsion motor was overstated; it was not like an induction motor. The pole-changing motor was only suited for small sizes, and the moderately high frequency suggested was, for railway work, say, 25 periods. Tappings from the transformer could be easily arranged to give a smooth change-over between the different pole connections.

MR. NICHOLSON added that they were carrying out experiments to ascertain the iron loss in the machine.

The International Electrotechnical Commission.

ON December 19th PROF. SILVANUS THOMPSON delivered a lecture on "The Work of the International Electrotechnical Commission," at the Institution.

In the course of an interesting address he dealt chronologically with the events which have led up to the present time, illustrating the necessity for international agreement and uniformity in the matter of standards, definitions, symbols, &c., by many well-known examples.

He traced the inception of the idea of international standards to a paper by Sir Chas. Bright and Prof. Clarke Maxwell, touching on the various events which intervened between that time and the International Electrical Congress of St. Louis in 1904, when Col. R. E. Crompton—the present hon. secretary of the Commission—read a paper on electrical standardisation, the discussion on which ultimately led to the formal constitution of the present permanent Commission in 1906 under the presidency of the late Lord Kelvin.

Since then the work of the Commission has been continued under the successive presidencies of Prof. Elihu Thomson and Prof. Dr. E. Budde, and the 1908 Meeting in London, the Brussels Conference of 1910, and last year's Turin Meeting have been held, while future meetings in Berlin, next year, and San Francisco, in 1915, have been arranged.

In the course of his remarks, Prof. Thompson explained the working and organisation of the Commission, the formation of the Special Committees to deal with the preliminary details of subjects brought forward, and the progress which has been made in such matters as nomenclature, symbols, &c.

He further emphasised the world-wide approval of the Commission's objects as evidenced by the probable formation of electrotechnical Committees in Australia, New Zealand, Siam, South Africa and South American countries, some of which have already taken this step. Detailed information on this subject is, of course, contained in the published reports of the Commission and the Institution *Journal*.

At the conclusion of the address, COL. CROMPTON said he himself had not been able to realise the great development which had taken place, in regard to which English electrical engineers could congratulate themselves. All the countries which had taken part had already gained from the mutual work, and he felt wholly a gainer by his own exertions in that connection. He concluded by paying a tribute to the work of the secretary, Mr. Le Maistre.

PROF. MILES WALKER said the main benefit of the work accomplished now was in the direction of machinery; as to nomenclature, he thought the only fault was the small number of words dealt with, although he appreciated the labour involved. He urged that no hesitation should occur in adopting foreign words where they were more appropriate than English ones, giving instances, and further suggested the advisability of employing sketches where possible instead of long descriptions. Symbols for mathematical use should never be letters, which should be displaced by a distinct notation.

MR. ROBT. HAMMOND caused some amusement by remarking that as hon. treasurer of the I.E.E., he had attended with a view to hearing what the Institution had got for its expenditure on the delegates, and had heard with pleasure that Prof. Thompson had had a very good time. He thought the Institution was entitled to hear from time to time an account of the work accomplished, and defended the labours of the Nomenclature Committee, explaining the difficulties which had to be contended with, a matter which was also mentioned by Mr. A. P. Trotter, who pointed out that the Com-

mittee was merely trying, in the first place, to record the accepted usage of words by British engineers, and that later the difficulties of international agreement would have to be overcome.

Reference having been made to the use of the word "Kelvin," MR. TROTTER said that 20 years ago Sir Courtenay Boyle advised the President of the B. of T. to adopt the name "Kelvin" for the "unit." The President cordially approved, and the decision was communicated to the electrical Press of that day; a fortnight afterwards, Lord Kelvin, on grounds of mere modesty, desired that it should be withdrawn. No one need wait for any authority to use it; it had been already officially sanctioned, and it only remained for them to use it.

PROF. THOMPSON briefly replied to the various speakers, indicating a preference for the term "continuous" rather than "direct" current, which, however, could not be arbitrarily enforced. The question of mathematical symbols was outside the scope of the Commission's work; the question of printing would have a great influence on any new symbol adopted.

Modern Methods of Indirect Lighting.

A PAPER under this title was read by MESSRS. F. W. WILLCOX and H. C. WHEAT, before the ILLUMINATING ENGINEERING SOCIETY, on December 3rd. The authors, after a brief description of various forms of direct and semi-indirect lighting, claimed that indirect lighting was an improvement on the other systems for the following reasons:—While on the score of pure physical efficiency (in lumens per watt) indirect lighting may stand below other systems, yet in point of visual efficiency its general results are comparable, and in many cases superior, to those given by direct lighting. The efficiency of indirect lighting depends very largely on the appliances used. The development of the "Eye-rest" system has given to indirect lighting an economy comparable with that of the best systems of direct lighting, and higher than that found in the general run of direct lighting installations. The substitution of eye-rest lighting for direct-lighting has, in numerous cases, resulted in improved illumination and reduced current consumption. Theoretically, the ideal direct lighting installation must have a higher energy efficiency than indirect lighting, because, in the latter case, the light has to undergo double reflection; the great point, however, about indirect lighting is that it enables one to get from a single point a more evenly distributed illumination than can be obtained from a much larger number of direct lighting units. In other words, the man who has become converted to the desirability of a uniform general illumination can, by substituting an eye-rest fitting for a single direct lighting point, make the intensity of illumination on the working plane approximately even. Without the aid of indirect lighting he would need in a fair-sized room at least half a dozen direct lighting units to accomplish this. Therefore, in view of the usual type of installation, with its strictly limited points, indirect lighting is actually and practically more economical than direct lighting, because it provides an ideal illumination with a minimum of wiring extension or alteration to the wiring.

Glare is undoubtedly reduced to a minimum by the indirect system of lighting. The lamps themselves are completely hidden, and the greatest surface brightness, that on the ceiling, is very much lower than with other forms of lighting. The large area of the reflecting surface, *i.e.*, the ceiling, ensures perfect light diffusion, with a total absence of the uncomfortable effects associated with glare.

In respect of shadow effect, indirect lighting stands pre-eminent. Shadows are less dense, and have softer edges than in the case of direct lighting. Indirect lighting, however, is not shadowless—it would be objectionable if it were. Indirect lighting does not affect the natural contrasts of light and shade given by good daylight illumination, and thus there are no flat or monotonous effects such as accompany cornice or cove lighting.

A diffused illumination is produced resembling the effects of daylight entering a room through a skylight or obscured glass roof. By proper tinting of the walls the light can be toned to give rich warm attractive effects. Harsh contrasts, glare and heavy shadows are eliminated, and the architectural features of the room are shown to the best advantage.

RECENT IMPROVEMENTS IN MERCURY VAPOUR RECTIFIERS OF LARGE POWER.

AN account appeared in these columns some two years ago giving particulars of a mercury vapour rectifier of large size in which sheet steel cylinders took the place of the usual glass containing vessel. Since that time further improvements and alterations have been suggested by the experience gained, and some account of these and of the first completed European installations are given by Herr B. B. Shäfer in the *Elektrotechnishe Zeitschrift* for November 7th.

The form of joint originally adopted, and consisting of a double packing of asbestos or similar material, with a layer of mercury between, has proved thoroughly satisfactory. Fig. 1 shows this joint as used on the main enclosing tube. *g* is the wall of the steel tube turned at the lower end, and having a ring *a* shrunk on to it. This ring is bolted to the base *b*, and exerts a uniform pressure on the asbestos packing *c*, leaving the space *e* for the mercury. Exhausted vessels sealed in this way have been sent by rail, and have arrived at their destination with unimpaired vacuum. Fig. 3 shows the arrangement for leading in the upper electrode. It will be seen that a single nut applied outside holds the whole in position, and at the same time provides a simple means of taking up any slack in the asbestos packing if this should be necessary at any time.

Although the jointing employed has thus proved itself satisfactory, it was soon found that some modification of the internal arrangement of the electrodes was necessary if "back-firing" (or the flow of current in the reverse direction, instead of only in the rectified direction) were to be avoided. This back-firing trouble has long been known to occur, especially with higher voltages, such as 220 or more, and with higher outputs. Normally the current

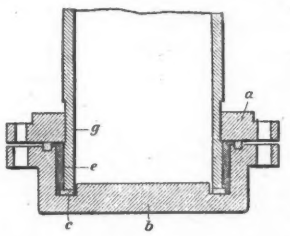


FIG. 1.

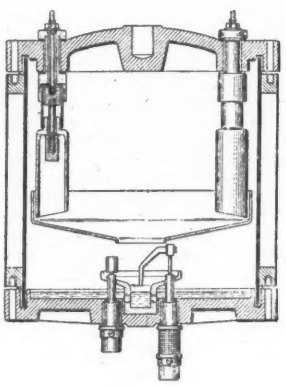


FIG. 2.

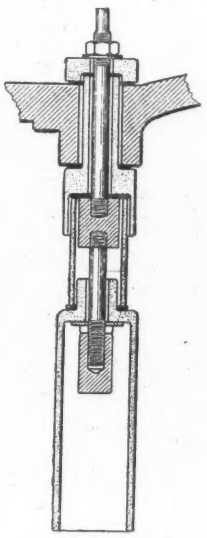


FIG. 3.

flowing through the rectifier in the reverse direction is a matter of only a few milli-amperes, and of quite negligible importance. Occasionally, however, the valve-like action of the rectifier will disappear suddenly, and current flows equally readily in both directions, and this, with the connections ordinarily adopted, means the complete short-circuiting of the supply. With the older glass rectifiers this occurrence generally resulted in the destruction of the glass vessel, whilst with the new steel apparatus an explosive blowing of the fuses at least follows.

As a result of lengthy experiment, it was found that "back-firing" may occur:—

1. If the vapour pressure in the exhausted vessel becomes too great, and so permits the discharge to change from the harmless glow discharge into an arc-like discharge.

2. If the electrode normally intended for the anode comes into contact with the condensed drops of mercury dripping back to the

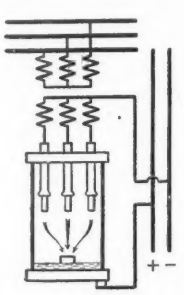


FIG. 4.

cathode, under such circumstances the anode develops the same characteristics as the mercury cathode.

3. If the solid electrodes lie in the path of the so-called "negative flame," or stream of hot conducting vapour rising from the cathode.

The question of a sufficiently high vacuum can be satisfactorily dealt with in practice, but points (2) and (3) require a complete modification of the arrangement originally adopted. Following the construction adopted in the glass rectifiers used in America for

very high D.C. voltages, such as 6,000 or 8,000, the new steel rectifiers are now arranged with the anodes enclosed in long protecting hoods, and removed from the centre line directly over the cathode and placed close to the sides of the vessel.

One great additional advantage of this arrangement is that it lends itself to the use of a number of small anodes in parallel instead of one large one, and this prevents overheating and vaporisation of the anode material.

The new arrangement is shown in fig. 2. Here the cathode at the bottom of the vessel is separated from the anodes by a non-conducting screen with a central opening. The conducting part of the vapour, after passing through this opening, is deflected towards the various anodes whilst the non-conducting portion is

FIG. 5.

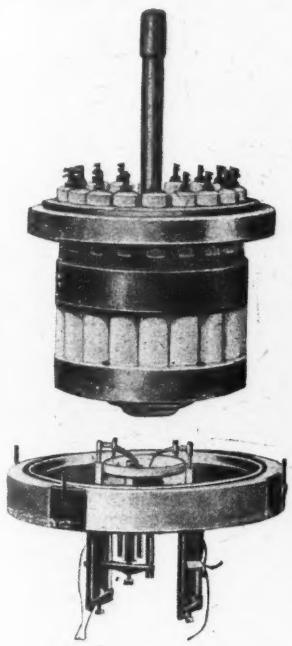


FIG. 6

FIG. 7.

partly cut off by the screen before entering the anode chamber at all, and partly rises up vertically through the opening—in either case avoiding all risk of coming into contact with the anodes.

This type of rectifier lends itself especially well to polyphase work, the various anodes, in a single enclosing vessel, being distributed amongst the different phases, as shown, *e.g.*, in fig. 4, for the case of a three-phase supply.

The peripheral arrangement of the anodes also enables a large and effective cooling chamber to be easily fitted above the rectifier in much the same way as that used with the small power glass rectifiers. Figs. 5 and 6 show the arrangement of the anodes and cathode respectively of a 100-KW. rectifier, whilst fig. 7 shows the general arrangement of a finished 100-KW. rectifier.

Amongst the other improvements introduced as a result of extended experience is an arrangement for measuring the state of the vacuum. The vacuum required is a high one of the order of ·01 mm. of mercury or less, and no convenient direct method of measuring this is available, consequently an electrical indirect method has been adopted, as shown in fig. 8. In this apparatus the fact that the conductivity of the gap between an anode and the active cathode depends greatly on the vacuum, is made use of. If the ordinary supply voltage is applied, and a suitable ammeter is introduced into the circuit, the indications of the instrument (after calibration with a McLeod gauge) serve as a very delicate indicator of the state of the vacuum.

Another arrangement for the same purpose is shown in fig. 9. A glass chamber containing an iron wire resistance is connected to the rectifier chamber and a voltage is applied to the resistance through an ammeter. The current flowing depends on the temperature of the wire, which itself varies with the vacuum owing to the greater or less heat conductivity of the surrounding gas.

Both these arrangements are suitable for mounting on the switchboard at a distance from the rectifier, and, if desired, they can be made to operate alarms when the vacuum becomes defective.

With regard to the actual plant in practical operation up to present time the following particulars are given :—Since November, 1911, a 220-volt 80-KW. rectifier has been in regular use in an iron foundry, and has been supplying the whole power plant for some 10 hours daily. The supply is a single-phase one at 2,850 volts 45·3 ~. In this case the continuous excitation of the cathode is maintained by a small rotary converter of 1·4-KW. output, but this might equally well be replaced by a small stationary rectifier When the current taken from the rectifier exceeds about 200 amperes, it is found necessary to keep the vacuum pump running continuously, but for smaller loads this is not necessary.

A smaller rectifier of 20-KW. capacity and self-exciting is in use in a sub-station at Strassburg, giving 110 to 160 volts for use in a small local D.C. network, and for charging a stand-by battery. In this case, three separate rectifiers of 100 amperes output each are installed, one of them being a spare.

Another larger self-exciting rectifier of 300-KW. capacity has recently been erected at an engineering works in Mannheim. It is supplied from a 3,150-volt three-phase 50 ~ circuit through a transformer, arranged to give out low-tension six-phase currents, which

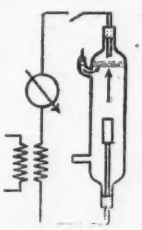


FIG. 8.

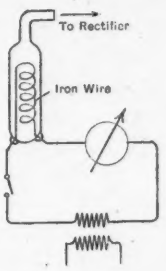


FIG. 9.

are rectified into a direct current of 2 × 220 volts, with practically no pulsations. Complete efficiency and other tests are now being carried out on this plant, and will be published later.

Tests on various rectifiers have shown that the pressure drop in the arc is as low as 11·7 volts, with a 7-cm. gap, and 14 volts, with a 25-cm. gap, between electrodes. The temperature of the iron anode in the case of a 32 sq. cm. anode loaded with 30 amperes, was found to be from 550° to 650° C. The temperature at the hottest point in the arc was about 1,000° C.

The amount of the reverse current was only about ·4 milliampere at a load of 110 volts and 30 amperes, and ·6 milliampere at a load of 60 amperes. As the voltage is raised the reverse current also increases, but not quite in proportion.

In conclusion, the following weight comparison between these mercury vapour rectifiers and ordinary high-speed rotary converters is given :—

KW. output.	Approx. total weight in lb. Mercury rectifier.	Rotary converter.
20	400	1,040
40	470	1,820
75	760	2,880
100	1,060	4,200

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Stage Lighting B.T.H. Lens Arc Lamps.

THE BRITISH THOMSON-HOUSTON CO., LTD., of Mazda House, 77, Upper Thames Street, E.C., have brought out a lens or spot lamp for theatrical purposes, designed to withstand the rough usage to which such apparatus is constantly subjected. The mechanism

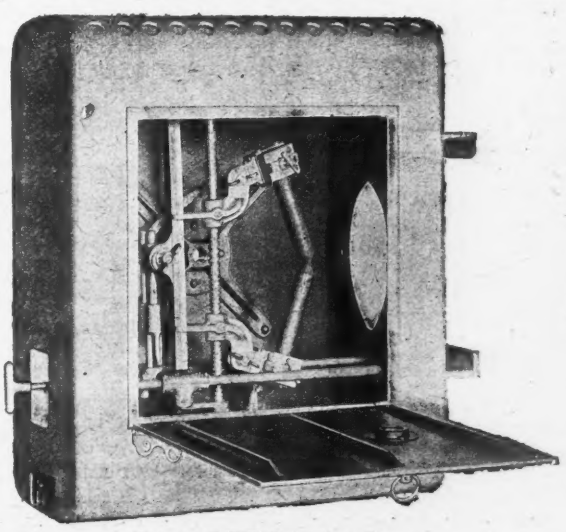


FIG. 1.—B.T.H. LENS ARC LAMP.

is of extreme simplicity and reliability. The lamp is of the "hand-feed" type, and is easily adjusted; after the first adjustment of the carbons, an arc can be maintained without interference for 30

minutes or more. It can be tilted in any direction while burning, without readjustment and without fear of the lamp parts earthing on to the casing.

The lamp box is a solid aluminium casting, with an aluminium door held closely against a rabbet set in the box casing, by self-closing phosphor-bronze spring hinges, thus preventing leakage of light. The lamp and lens frame are well ventilated; the orifice is adapted for standard lenses of 4½ in. or 6 in. diameter, expansion being allowed for in either case.

Focusing is accomplished by the operation of a carriage rod, to which is attached a handle in the rear of the lantern controlling the mechanism of the focusing rod. The vertical spindle which supports the carbon-holders is fastened to two focusing rods by means of spring steel shoe slides. The carbon-holders are adjustable by means of heavy thumb screws, so that practically any position of the carbons may be obtained, and the holders are made in two parts, one of which is detachable. The vertical spindle for an alternating-current arc is made six threads to the inch (right and left hand), and for direct current, four and six threads to the inch respectively. This arrangement renders the use of carbons of different diameters unnecessary, as the positive carbon, burning more rapidly than the negative, is fed at a proportionately greater speed.

New Electric Winch.

The accompanying illustrations show the construction of a new patent electric winch which has been made for the inventors, Messrs. Tyler & Freeman, by the India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd., of Silvertown, and which possesses remarkable features. Briefly, the motor is inside the barrel of the winch, and the whole is totally enclosed and waterproof.

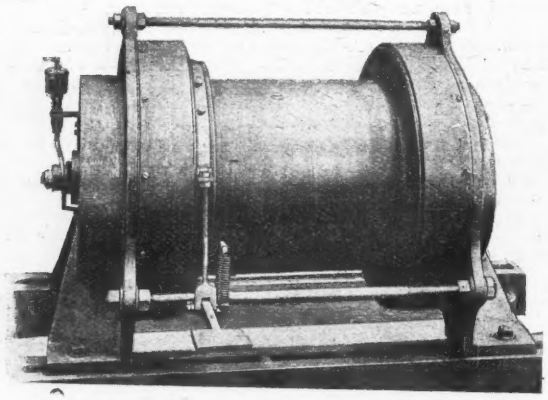


Fig. 2.—Tyler & Freeman's Self-Contained Electric Winch.

As will be seen in the drawing, fig. 5, the revolving barrel on which the hoisting rope is wound forms the yoke of the D.C. motor, the pole-pieces being screwed to its internal circumference; the windings are attached to the pole-pieces, and the brush gear carrier is also fixed to the barrel, together with a flange to which a diaphragm with a gland on the armature shaft is attached, thus shutting out any oil that might leak from the gear to the windings.

The gearing is of the epicyclic type, with three pinions, which engage with two internally toothed rings; one of the latter is attached to the revolving barrel, and the other to the end bearing. For high-speed hoisting the barrel is mounted on ball bearings of large diameter, but for low-speed work the bearings are plain.

The armature shaft is also mounted on ball bearings, and is hollow, a central tie-rod passing through it. The end bearing at the armature end carries four slip rings, which enable the current to be taken to the fields and to the armature. Reversing is effected by means of an ordinary controller. The separate views (figs. 2 to 4) show the details very well. A curious feature of the design is that the field magnets revolve slowly in the same direction as the armature, carrying the brushes with them.

The design shows that the motor is entirely enclosed, there being no openings for water at either main or central bearings. Hand holes are provided in both end bearings, which have water-tight covers.

Fig. 3.—Winch Details; Barrel, Slip Rings, Brushes, &c.

Lubrication is well provided for, and the winch is mounted on a substantial cast-iron base.

The gear shown is very fairly silent, and the efficiency is very high. The winch is specially designed for shipwork, but is equally applicable to any position where compactness and complete protection from weather, &c., are essential. It is made in various sizes, and the gear lends itself especially to adaptation for any ratio of reduction, high or low.

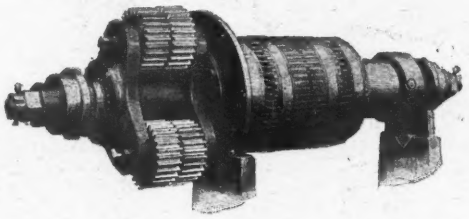


Fig. 4.—Internal Armature and Epicyclic Gearing.

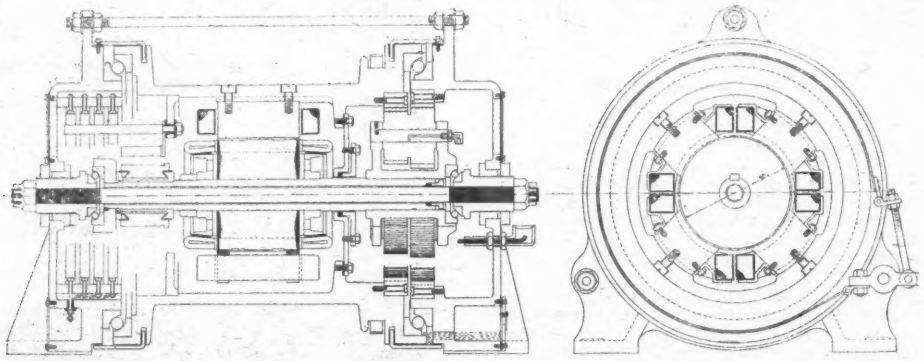


Fig. 5.—Sectional Views of Winch with Internal Motor.

Henley's Cable Suspenders.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., Blomfield Street, London Wall, E.C., have issued a new price list of their patent cable suspenders. These are now made in Balata canvas and impregnated canvas, as well as in raw hide and zinc, new suspenders in these materials having been standardised by the firm to meet a demand for cable hangers having a much longer life in damp situations or places where they are likely to come in contact with fumes which would be injurious to other types. The present list also contains particulars of 1½ in. suspenders in all types suitable for use where it is impossible to place the suspenders close together, or for use with very heavy cables. We learn that many hundreds of thousands of Henley patent suspenders have been sold in the British Isles and abroad, and that the approximate breaking strains are as follows:—

	¾ *in. wide.*	1½ *in. wide.*
Zinc	200 to 250 lb.	400 to 450 lb.
Impregnated canvas	200 lb.	300 lb.
Balata canvas ...	200 „	300 „
Raw hide	100 „	200 „

The firm will send copies of the list and discounts to anyone in the trade. In the figure we show a ·2 sq. in. cable suspended by

Fig. 6.—Henley Zinc Suspenders in Use.

Henley patent zinc suspenders (1½ in. wide) from a 7/10 strand. The illustration is half full size.

Arc Lamp Lowering Gear.

The London Electric Firm, of George Street, Croydon, have fitted up at their works working exhibits of their raising and lowering gear for arc lamps, including swan-neck and wall-bracket gear, span-wire suspension gear, and lyre-shaped centre-pole gear, for the inspection of prospective buyers.

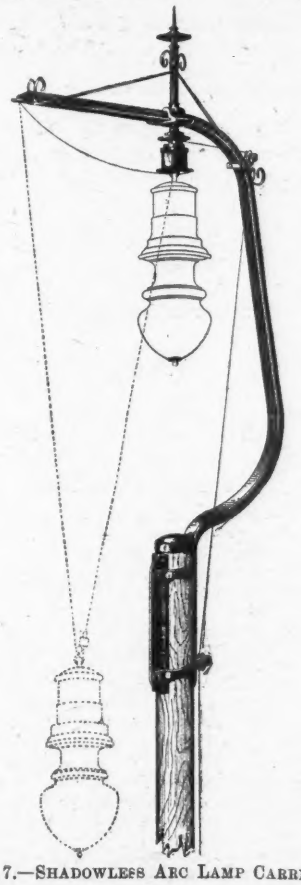


Fig. 7.—Shadowless Arc Lamp Carrier.

The accompanying illustration shows their new shadowless ("half lyre") arc lamp carrier, superseding, at less cost, jibs and swan necks, or ladders, for the lighting of railways, docks, harbours, quays, works, &c. This is an adaptation of the firm's patent lyre-shaped centre carrier, and is adaptable for any size or kind of pole, of wood, iron or concrete. It is provided with their automatic connector and patent suspender, or if a cheaper arrangement is desired, with their patent safety catch only, either plan ensuring that the weight of the lamp is positively taken by the carrier, and not left on the hauling rope when in the burning position.

In designing this new carrier the makers have had in mind the desirability of obviating the excessive swinging of the lamp in exposed positions during windy weather, and an efficient limiting device can be provided when necessary. The winch used with these carriers is of their patent self-sustaining type, by which the risk of failure in raising or lowering is eliminated.

Electric Vulcaniser.

The St. Helens Cable and Rubber Co., of Warrington, have recently designed and patented (No. 2,3451—1912) a novelty in the form of an electric vulcaniser, of which fig. 8 is a view.

This has been specially devised for use in connection with the jointing and repairing of their patent cab-tire sheathed cables, and is based upon arrangements suggested by Mr. R. W. Besford, of Chester-le-Street.

The principle is the electrical heating of the mass of wax used for vulcanising purposes, by means of a current passing through wire spirals contained in the wax. The heat is regulated by the rheostat shown, so that the maximum heat can be switched on at first to melt the wax, and when the required temperature is obtained in the bath, it can be kept constant by switching on to a more suitable combination

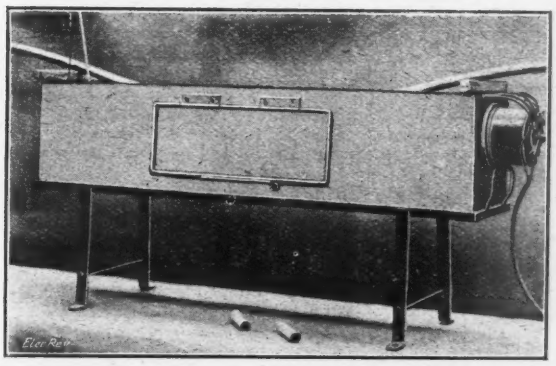


Fig. 8.—An Electric Vulcaniser.

It is not always easy or possible to vulcanise cables (at the place of use, such as in mining work) by means of steam, as this varies so considerably both as to pressure, heat and humidity. Gas is not always available, whereas electric current can be had wherever cab-tire sheathed cables are used, and the practical constancy of electrical pressure renders the apparatus easily used without skilled attention.

We have received a piece of jointed cable, which shows the homogeneous character of the joint made with this apparatus.

The jointing tape is the same cab-tire material as that used in the sheathing, made in the form of tape, which is bound around the already prepared joint and then further lapped with a strong fibrous tape, which compresses it tightly, and under the heat of the vulcanising process, makes the solid joint.

A recent instance of this electrical vulcaniser's usefulness may be mentioned: A cab-tire sheathed crane cable at a Middlesbrough dock had been damaged by the crane making a split in the sheathing of 28 in. This was repaired by this patent electric vulcaniser while the crane was operated by current passing through the cable under repair. The operation took two hours, and the completed job appeared to be equal to new.

Lightning Files.

A high-speed Lightning file has recently been placed on the market by Messrs. Lockwood Bros., Ltd., of Spital Hill, Sheffield, who inform us that a 14-in. file, tested on both sides, made 120,000 strokes, and in 39 hours removed 78·8 in. of metal weighing 22 lb. from an inch-square bar, and at the conclusion of this severe trial the tool was "slightly worn." The makers claim the result of the test to represent the highest point of working efficiency ever attained by a file under similar conditions. It is stated that the Admiralty require the files they buy to make only 20,000 strokes and to remove 6 in. of material. In round figures the Lightning file is capable of doing treble the amount of work that can be got out of an ordinary file, and as the increased price is inconsiderable, it must be highly economical in use.

THE PHYSICAL SOCIETY EXHIBITION.

The exhibition of physical apparatus which was held on Tuesday last week at the Imperial College of Science, while less comprehensive than usual, contained several features of great interest. Amongst these may be mentioned the beautiful "rainbow cup" recently devised by Mr. C. V. Boys, F.R.S., for the examination of liquid films, with which the most fascinating colour effects can be produced; the Gray-Burnside motor gyrostats; the Marconi radiogoniometer; the Nalder insulation recorder for A.C. circuits; new "Unipivot" instruments; the Levy apparatus for the estimation of firedamp; and a Cardiographic apparatus.

In the afternoon and evening Mr. S. G. Brown lectured on "Some Methods of Magnifying Feeble Signalling Currents."

Westminster Engineering Co., Ltd.

A very neat projection arc lamp was shown by this firm, for currents from 2½ to 12 amperes on D.C. or A.C. circuits, of 100 to 250 volts pressure. As shown in the accompanying illustration

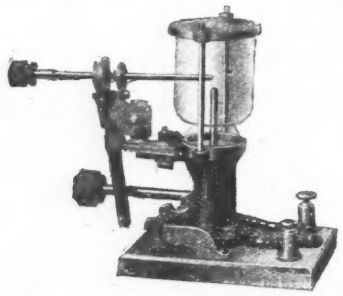


Fig. 1.—"Westminster" Projection Arc Lamp.

the mechanism is of great simplicity; the arc is formed in a closed chamber, enabling it to burn for half an hour or more without attention, and the adjustment is effected by hand. The carbons are at right angles, the crater of the positive carbon (in the case of direct current) being thus utilised to the utmost, and the source of light remains practically stationary at the focus of the lantern for long periods, being always on the centre line of the condenser. The light is very steady, and the consumption of carbon is small. The light obtained is either white or violet-tinted, according to the purpose for which the lamp is being used, and the humming of the lamp on A.C. circuits is very much reduced by the glass enclosure.

Alex. Wright & Co., Ltd.

An instrument for the continuous registration of the specific gravity of a gas to 1 part in 1,000 was shown, as well as an improved arrangement of the Orsat gas analysis apparatus. The most noteworthy novelty was Dr. Leonard A. Levy's apparatus for the estimation of fire-damp in the air of mines, to meet the requirements of the Coal Mines Act of 1911. This interesting device is illustrated in fig. 2.

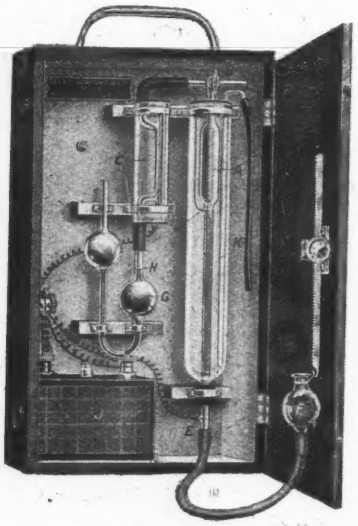


Fig. 2.—Levy Fire-Damp Estimating Apparatus.

The measuring burette A, surrounded by a water jacket, contains 10 c.c. The narrow graduated stem contains 0·4 c.c., and reads to 2 per cent. of fire-damp. The burette is graduated to read to 0·01 per cent. B is a cock with an L-shaped bore arranged so that it is impossible to place the oxidation tube C in communication with the atmosphere. The plug of the cock has a screw washer fixed at the back, so that it cannot be accidentally withdrawn from the barrel. C is a new type of oxidation tube devised by Dr. Leonard Levy; it consists of a quartz capillary tube through which a platinum wire runs axially. This wire is heated to whiteness by a current derived from the small storage cell J supplied with the apparatus; the expansion of the wire on heating is taken up by a spring to which one end is attached. The walls of the capillary tube are coated with a very thin layer of platinum, which catalytically accelerates the rate of oxidation of the combustible gases. This oxidation tube is entirely surrounded by a water-jacket. The current passes through the platinum wire when the mercury in the burette reaches the fused-in platinum contact D, connection to the mercury being made through the fused-in contact at E. It is thus evident that the current only passes when the reservoir F is raised to drive the gas through the tube C. Thus the operation of passing the gas over the wire automatically switches on the current.

During its passage through the quartz platinum capillary tube over the heated wire, the fire-damp present, no matter how little, is completely oxidised by the oxygen in the air to carbon dioxide and water; a contraction equal to twice the volume of fire-damp is thus produced. The burette is graduated to read directly the percentage of fire-damp present. The graduations at 0·25 per cent., 0·5 per cent. and 1·25 per cent., the three limits specified in the Act, are marked in red. Two passages of the gas through the quartz platinum capillary are sufficient, and an estimation can readily be effected in 2 minutes. An accuracy of 1 part in 1,000 is easily attainable.

Before using the apparatus, the vessel G must be filled to the mark H on the capillary neck with mercury, the cock B being turned so as to communicate through the *empty* burette with the atmosphere; H is therefore the level of the mercury in G at atmospheric pressure. The reservoir F is also filled with mercury, and the jacket surrounding the burette is filled with water. These manipulations are made on receipt of the apparatus, and do not require subsequent repetition.

The apparatus is very small and compact; the external dimensions of the case are 13½ in. × 8 in. × 3 in., and the total weight ready for use is 8 lb.

By adjusting the reservoir F by the rack and pinion until the mercury in the capillary neck at H is accurately at the mark, any change in the temperature of the gas is corrected.

The apparatus can be used in the most fiery mine, without the slightest danger, as it is impossible to produce a spark in air with it, even if it is dropped and broken, and it can be manipulated by an inexperienced person. A more elaborate apparatus is made for the complete examination of the air of mines.

In view of the stringent provisions of the Act regarding the use of electrical apparatus in places where the percentage of fire-damp present exceeds 1¼, this device is of considerable importance to mining electrical engineers.

Evershed & Vignoles, Ltd.

This firm had an interesting historical exhibit of Evershed resistance testing sets, from the first made, in 1889, to the introduction, in 1904, of the "Megger" and, in 1904, of the "Bridge-Megger," covering a range of measurements from 0·1 ohm to 5,000 megohms.

Gambrell Bros., Ltd.

The convection radiometer and thermo-galvanometer recently designed by Mr. F. W. Jordan for measuring small steady rates of evolution or absorption of heat was shown; this was described in our issue of November 15th, page 814.

John J. Griffin & Sons, Ltd.

The most novel exhibit of this firm was the Boys "rainbow cup" mentioned above; the electrically-driven gyrostats of Messrs. J. G. Gray and G. Burnside were also shown in operation.

The Synchronome Co., Ltd.

A complete working exhibit of electrical instruments suitable for the measurement and distribution of time in observatories and scientific institutions was shown, employing the Synchronome astronomical regulator; the improved Synchronome controlling pendulum with Mr. W. H. Shortt's inertia escapement was also shown in operation.

(*To be continued.*)

LEGAL.

The Distribution of the Assets of the National Telephone Co.

(*Continued from page* 988.)

Continuing his address on behalf of the deferred stockholders, Mr. Younger, K.C., said the preferred stockholders, he contended, had not established any right to a dividend or interest in respect of their holding after December 31st, 1911, the date of the sale of the company's business, and beyond the £105 which had been repaid to them as their capital holding, they were not entitled to share in the assets of the company. Beyond the £105, everything else went to the deferred stockholders, according to the terms of the resolution by which the stock came into being. The sum which the deferred stockholders were entitled to bring forward as their contribution to capital, and in respect to which they were entitled to participate, was £5,950,000, the capital paid up on the preferred and deferred stock. The first and second preference shareholders were excluded by the articles of the company, and the third preference shareholders were, on the principle that a preference share gave its holder no more than it bargained to give, and also on the principle laid down in another case, they were not entitled to participate in the surplus assets.

After Mr. Younger had concluded his arguments, his Lordship said that any order made on this or any other summons dealing with the matter was to be a final order covering everything in relation to the way the assets were to be distributed, so that if there should be an appeal from his judgment to the Court of Appeal, and ultimately to the House of Lords, which might very well be, having regard to the magnitude of the sums involved, the decision of the House of Lords would govern the matter. He proposed, therefore, to put the matter in such a form that, if it went to the House of Lords, that House would be in a position to pronounce a final judg-

ment on the whole case, and to have a final order of his going up to the House of Lords, and the whole of the distribution of the assets remaining in abeyance until some further points were decided. Of course, there could not possibly be any final settlement or distribution until after the award, when one knew the amount to be distributed. He therefore proposed, at the conclusion of the arguments upon the present summons, not to reserve judgment, but to adjourn the further hearing of the matter, first, until after the award, and, secondly, until after any person who might wish to take out a summons raising any other point, had had an opportunity of doing so. If and when such a summons was taken out it would be adjourned to come on for further hearing, so that there might be one comprehensive order dealing with every point.

Mr. Younger said that the course proposed by his Lordship would cause no inconvenience, because there could be no distribution until after the award was made.

The further hearing of the summons was then adjourned until after the award.

Hereford Electricians' Claim.

At the Hereford County Court Messrs. Walker & Co., of 11, Widemarsh Street, Hereford, electrical engineers, sued Leonard Lane, a commission agent, of Victoria Street, for £24 5s., for work done. There was paid into Court the sum of £20, and the full claim was resisted, because it was alleged that part of the work was not done properly.

Evidence was given by Mr. Walker, who claimed that the charges for the work were quite reasonable. He said he did not put a main switch in because it would have cost £5, and Mr. Lane had complained of what the work was costing. It took from May to September to put in the supply, because the firm had to work with the builders.

Mr. C. E. Gray, electrical engineer and chief secretary of the Ross Electric Light Co., said the price Messrs. Walker had charged was reasonable.

The Solicitor for the defendant contended that the work took a long time, and the requirements of the local by-laws had not been complied with. No main switch was provided, and when the authorities knew that this was the case, they sent to Mr. Lane and told him if the matter was not attended to within 48 hours the supply would be cut off.

In giving judgment, His Honour said there were two points in the case. One was that the work was not properly done, because a switch was not provided. He thought two guineas must come off the claim because of work that had to be done later owing to this omission. The second point was that of the percentage on the discount—Messrs. Walker had promised 10 per cent.—but as Mr. Lane was not present, he would not go into that. He would give judgment for £21, costs to follow the event.

Workman's Compensation Case.

At the Manchester County Court on the 19th inst., a peculiar case under the Workmen's Compensation Act came before Judge Millor. Messrs. Halliwell & Co., electrical engineers, of Thomas Street, claimed an award terminating compensation of 17s. 8d., payable to Thos. M'Dunough, of Tell Street, Chorlton-on-Medlock. It was stated that in December, 1910, the workman struck his left hand with a hammer and injured it so severely that one of the fingers had to be removed, owing to blood poisoning. Eventually, his mind gave way, and the Court appointed Mr. James Rowan, secretary of the Electrical Traders' Union, of which Mr. M'Dunough was a member, as his guardian *ad litem*. Mr. T. Lord, solicitor for the employers, contended that the present incapacity did not arise out of the accident, and produced the evidence of two medical men to the effect that the lunacy was caused by disease and alcohol. Mr. Ashworth, solicitor for the workman, admitted that his medical men being of the same opinion, all he could now insist upon was a declaration of liability to cover possible future developments.

The Judge agreed, and made an order accordingly.

Appeal by Bristol Tramways and Carriage Co.

The Court of Appeal, composed of the Master of the Rolls and Lords Justices Farwell and Hamilton, on Friday delivered a considered judgment on the defendants' appeal in the case of Newberry *v.* Bristol Tramways and Carriage Co., Ltd., in which the plaintiff was awarded £150 at the trial before Mr. Justice Channel and a special jury at Bristol.

The plaintiff, Mr. James Newberry, a traveller and dealer in general goods, of Bristol and Birmingham, claimed damages in respect of personal injuries sustained by him while travelling on the outside of one of the company's tramway cars. It appeared that the trolley came away from the overhead wires, and while the conductor was endeavouring to replace it, the trolley arm became detached from the standard, and in its fall it struck the plaintiff. The plaintiff pleaded that there was an onus on the company to prove absence of negligence on its part, or, alternatively, that it was guilty of a number of acts of negligence, which were set out in the particulars. The defence was a denial of liability. The jury found that the company, having used a detachable trolley arm, knowing the risk to passengers, did not take sufficient precautions for their safety, and in reply to the judge, the foreman added that not being engineers, they were not able to state what precautions should have been taken. Judgment being entered for the plaintiff, the company appealed on the ground that there was no evidence that it could, by the exercise of ordinary care and diligence, have avoided the accident, and also that it was protected from the consequences of the accident by its statutory powers.

The Master of the Rolls said he thought the verdict of the jury showed that the company had discharged the burden upon it. It was sufficient that the company, as carriers, should have and use the best known apparatus, keep it in proper order and worked properly by competent men. The company discharged all these obligations, and, therefore, he was of opinion that the appeal should be allowed and judgment entered for the company, with costs.

Lord Justice Farwell said that the evidence was that nobody on the company's behalf had ever tried experiments in order to see what could be done to protect the passengers from these accidents. The truth was that the company had not troubled to see whether it could find any remedy for it, and it had taken the chance. In his opinion, the verdict was one the jury were entitled to give upon the evidence, and he was not satisfied that the company had exercised due diligence and care. There was nothing in the Act of Parliament which justified the company carrying a full load of passengers outside if, by rearrangement of the seats, safety to the passengers could be secured. Under the circumstances, he thought the appeal should be dismissed.

Lord Justice Hamilton agreed with the judgment of the Master of the Rolls, and by a majority of the Court, therefore, the appeal was allowed, with costs.

BUSINESS NOTES.

Private Arrangement.—The Simms Magneto Co., Ltd., Kimberley Road, London, N.W.—Pursuant to the provisions of the Companies' (Consolidation) Act, 1908, a meeting of the creditors of the above was held on Tuesday, December 17th, at the Institute of Chartered Accountants, Moorgate Street, E.C. It was reported that the shareholders of the company had already met at the offices of the company, Welbeck Works, Kimberley Road, Kilburn, on November 28th, when a resolution was passed in favour of voluntary liquidation, with Mr. Archibald White, C.A., of 79, Wool Exchange, E.C., as liquidator. The chair was occupied by the liquidator, who stated that it had not been possible in the short space of time at his disposal to fully investigate the position, but he had prepared an approximate statement. There had been an action by debenture-holders, and he was appointed by the Court to act as manager and receiver, and he was now in possession of the whole of the company's property and undertakings. The debenture action was started in the name of Mr. Agnew, who was a holder of 6,800 debentures, Sir George Wm. Agnew who held 1,000 debentures, Miss Agnew who had 5,500 debentures, and two others. The total amount of the debenture charge was £34,000, but in addition there were debentures for £6,000 deposited as collateral security for a loan of £10,000. Therefore the total debenture charge was £40,000, plus the arrears of interest of £3,770. The company was formed in October, 1907, when it took over the business previously carried on by the Simms Manufacturing Co., Ltd. The assets taken over comprised stock, £7,100; plant and machinery, £6,200; fixtures and fittings, £1,220; patterns, £1,000; new buildings, £2,300; book debts estimated at £7,750; cash in hand, £1,600, and expenditure in advance, £445. In addition there were other assets consisting of licences, patents, and goodwill of the value of £25,921. There were also liabilities amounting to £18,435 which the company discharged, and that left the net value of the property taken over, including the goodwill, &c., at £34,270. The consideration in respect of that was the allotment of 10,508 fully-paid shares of £1 each in the new company; 16,917 shares of £1 each, on which 13s. 4d. was paid; 4,645 shares of £1 each, of which 15s. was paid; and £9,000 in fully-paid debentures. The debentures were allotted to Mr. F. Simms, one of the vendors. Debentures to the extent of £6,000 were also subscribed for in cash, and subsequently a further £10,000 was raised on second debentures. At a later date those debentures were cancelled, and there was a fresh issue of debentures for £40,000. Certain of the debentures were subscribed for at 80 per cent. of their face value, but the balance of 20 per cent. was paid over, and shares were taken in the company for the amount. Mr. Agnew and Mr. Simms held debentures for £6,000, against an advance of £10,000. The total issued share capital was £61,727. With regard to the assets, they were of a problematical character. The goodwill, licences, &c., stood in the books at £26,339, but what they were worth at the present time he was unable to say. The stock in trade was estimated at £20,000, and it was said to have been taken at cost. The stock included finished machines worth about £7,000, the remainder being in parts. The company manufactured all its goods in this country, and none were purchased from the Simms Magneto Co., of America. The English concern had no connection with the American company. The machinery and plant were valued at £10,417, and the other assets, included fixtures £875; book debts, £7,619, expected to produce £6,900; cash in hand, £562; and Paris branch, £6,000. The liquidator added that the Paris branch had always been a losing concern, and in the previous year the loss had been over £1,000. The company also held 1,525 shares of $100 each in the Simms Magneto Co., of America. Of those shares, 250 were attached in New York, and certain of the other shares were held as security for a cash advance. He had no intimation as to what the value of the American company's shares was. Excluding the goodwill and the shares, the assets of the

company amounted to £44,744. Against that there were debentures and interest for £43,700, a charge of £4,550 on the American shares, and preference claims of £800, or total liabilities to secured creditors of £48,020. With regard to the unsecured claims, they aggregated £10,284, and were all due to trade creditors.

In answer to questions, Mr. White said that there was a possibility of the business being sold as a going concern. He was continuing the business with a view to finding a purchaser for it, and was now in negotiation with two or three people.

Mr. E. H. Hawkins asked if the liquidator was making any profit in carrying the business on, and Mr. White replied that he would not like to say he was, although he had reduced the standing expenses very considerably. In answer to further questions, he stated that the business had been carried on latterly at a heavy loss, and no dividends had ever been paid.

A creditor said he understood that originally Mr. Simms had a working agreement with Mr. Bosch, and he asked if the company was formed after the termination of the agreement.

Mr. White replied that it was, and the creditor then stated that "of course Bosch has now got the trade."

Replying to further questions, the liquidator said that the business had been too heavily weighted by the establishment and supervision expenses. The company suffered very severely by the keen competition of Continental firms, who were selling at very cheap prices. He could not tell whether the Continental manufacturers were turning out goods cheaper than the Simms Magneto Co.; or whether they were making a bid for the trade. At the present prices he did not know how the company could hope to make a very large profit.

The opinion was expressed that a joint liquidator should be appointed to represent the interests of the trade creditors. The matter was discussed at some length, and eventually it was decided that application should be made to the Court for the appointment of Mr. E. H. Hawkins, of Messrs. Poppleton, Appleby & Hawkins, 4, Charterhouse Square, E.C., as joint liquidator with Mr. White. A committee of the principal creditors was also elected. The principal creditors are :—

Johnson, Matthey & Co.	£1,216
Krefeld Steel Works	730
Simpson Bros.	975
Electrical Co.	773
Automatic Standard Screw Co.	640

Trade in 1912.—Messrs. Bolling & Lowe, in their annual trade review, refer to the unprecedented improvement that took place in trade conditions in all departments, in spite of labour troubles during the year. Not only in the British Isles was this the case, but in all industrial countries there is evidence of exceptional prosperity, and this is accentuated in the iron, steel and allied trades. In regard to the copper market, they write as follows :—

"The copper market has been in a wonderfully strong position, and prices of standard metal rose from about £61, early in the year, to £80 or thereabouts, about the middle of June, remaining in the neighbourhood of the higher figure, though with fluctuations, until now. The advance was based upon a continuance and extension of the sound conditions which in 1911 took prices from £53 to £64. Throughout the first six months of the year the world's statistical position improved steadily. On December 31st last the total visible supply was 110,619 tons, while on June 30th low-water mark was reached at 67,930 tons. During the second half of the year the visible supply increased steadily in consequence of accumulations being in progress at the United States refineries, which more than counterbalanced a drain upon the reserves in Europe, hence the market suffered a diminution of buoyancy, standard metal developing an irregular movement, even though the big American producers, who lifted their price for electrolytic copper to £82 in the autumn, showed an unbending front. The war in the Balkans has affected sentiment adversely during the past two months or so, and this, in conjunction with the very heavy American production, affords ample justification for the halt which has been called in the upward movement. Just at present, and on the basis of current supplies and demands, copper judged from a broad standpoint, seems sufficiently dear, although a boom in America, synchronising with exceptional activity in Europe, might justify higher prices. The extent to which production has increased is shown by the fact that the United States output for the first 11 months of 1911 was 584,000 tons, while for the same period of this year it was 642,000 tons. The monthly average of 53,000 tons last year has thus been converted into a monthly average of about 58,500 tons. Actually the increase has been on a progressive sale from 49,030 tons in November last year to 65,000 tons in October of this year."

In their concluding observations Messrs. Bolling & Lowe describe 1912 as "the banner year" of British prosperity, and they add :—"We do not attach the importance that some of our friends do to the troubles in the labour world. The leaders of Capital and Labour bound by the common bond of economic conditions, will find a satisfactory method, possibly that of Sir Charles Macara, to adjust the claims of both without the suicidal strike or lock-out. With an absence of labour troubles, and a settlement of the European complications, we see no reason why the present prosperous trade conditions should not continue throughout 1913."

Messrs. W. C. Martin & Co., electrical engineers, of Glasgow, &c., who specialise in the electrical equipment of steamships, report having experienced a steady flow of business during the past year. Among the larger vessels fitted out by them were the British India Steam Navigation Co.'s t.s.s. *Aronda*, built at Linthouse, and the t.s.s. *Hurunui*, built at Port Glasgow, for the New Zealand Shipping Co., Ltd. Special mention may be made of the s.s. *El Uruguayo*, also built at Linthouse for the South American frozen meat trade, containing the largest refrigerating plant ever fitted on board a ship, also the large Austro-American steamer *Kaiser Franz Joseph I*, built at Monfalcone, Trieste. In addition, this firm completely refitted the t.s.s. *Carmania*, involving some 2,500 lights, besides power circuits, after the disastrous fire which practically gutted the vessel. Messrs. Martin have large orders in hand with which to start the New Year, including the electric installation on the new Cunard R.M.S. *Aquitania*, the largest ever fitted on board a vessel, also the t.s.s. *Gelria* and *Tubantia*, for the Koninklijke Hollandsches Lloyd, Amsterdam, as well as a number of other smaller vessels. One of the greatest lessons emphasised by the terrible disaster to the R.M.S. *Titanic* was the advisability of providing means on board ship, by which the electric supply of the principal parts of the vessel could be maintained up to the very last moment in the event of such a disaster. The method employed by Messrs. Martin to provide an emergency generating plant fitted on the highest deck, is now being adopted on a number of large vessels.

Another special feature in electrical installations as fitted by Messrs. Martin is the increased use of electrical appliances of all kinds on board ship, not only in driving auxiliary machinery in the engineers' department, such as pumps, fans, thermotanks, &c., but for working goods and passenger elevators, cranes, winches, and also in the culinary and stewards' departments. Electric dough-mixers, knife-cleaners, egg-boilers, grills, hotplates, toasters, and other appliances too numerous to detail, are now the rule rather than the exception, while a ship's laundry is not now considered up-to-date without electric washing and ironing plant, and no liner is complete without an electrically-driven gymnasium, not to mention such appliances as electric hairbrushes, electric hair dryers, electric curling irons, electric cigar lighters, &c.

Liverpool Exhibition, 1913.—We have received a copy of the prospectus of this Exhibition, which is to be held from May to October next on the Edge Lane Hall Estate, Liverpool, under the direction of Liverpool Exhibitions, Ltd. Applications for space are required by the general manager (Mr. C. P. Hainsworth, 31, North John Street, Liverpool), by January 21st, so firms interested should write for particulars and forms at once. Sir Chas. Petrie is chairman, and Sir Robert Cranston is one of the directors. The object is to demonstrate to the citizens and to the general public, the commercial development of the city and its great activities as a centre of commerce and industry. It is stated that no great industrial exhibition has been held in Liverpool for over a quarter of a century. There will be, among other features, a "Palace of Electricity" for the display of electrical appliances, machines, &c., also a "Machinery Hall" and a "Palace of Industries." In the classification list, mention is made of mining engineering and metallurgy, transportation and motive power, lighting, heating and ventilation, chemistry and scientific appliances, and so on.

Fire Alarms.—At a cost of £182, the Sutton (Surrey) U.D.C. has accepted a tender for the installation of an electric system of fire-call bells; 19 bells will be fitted at the firemen's houses, and an automatic switch at the fire station, together with an "on" and "off" switch to the turncock and steam hooter.

Catalogues and Lists.—The Hoyt Metal Co. of Great Britain, Ltd., 26, Billiter Street, London, E.C.—32-page booklet, also a number of separate testimonial leaflets, relating to Hoyt's standard Babbitt or anti-friction metals, tests of same, directions for use, output figures over 13 years, code-words, and so forth.

The Foster Engineering Co., Ltd., Wimbledon, S.W.—Leaflet concerning their A.C. electric geyser, showing the alteration in general appearance since its first introduction. It is now supplied with an external casing of sheet copper or brass. Copies will be sent on application.

The British Westinghouse Electric and Manufacturing Co., Ltd., Trafford Park.—Envelope pamphlet entitled "The Power Policeman—What He Can Do for You," in which are described and illustrated their portable wattmeters and watt-hour meters.

The British Prometheus Co., Ltd., Salop Street Works, Highgate, Birmingham.—Third edition of catalogue No. 141. It consists of some 40 pages, and contains illustrations and prices of a variety of their electric cooking and heating apparatus, from a curling-iron heater to a hot cupboard. A number of original designs of Prometheus convectors are shown and priced on a separate leaflet. Contractors can have a number of copies of the catalogue bearing their own name and address.

The General Electric Co., Ltd., 67, Queen Victoria Street, London, E.C.—Twenty-page pamphlet entitled "Table Cooking by Electricity," containing illustrations, descriptive notes, and prices of electric toasters, cookers, hot-plates, "composite" breakfast sets, tea-pots, kettles, flat-irons, and so on.

Messrs. Borland, Hagedorn & Co., Ltd., 66A, St. Martin's Lane, London, W.C.—Illustrated and priced four-page list, describing stage projectors, gallery and vertical projectors, resistance frames, stage connectors, &c.

The Hart Manufacturing Co., 76 and 77, Rochester Row, Westminster, S.W.—Leaflet briefly describing and giving prices and diagrams of connections of their series-parallel three heat "Diamond H" switches.

Messrs. Tetley & Co., Falcon Electrical Works, Salford.—An illustrated leaflet describing their "Standard" ironclad stage plug also a price leaflet of "Falcon" mercury cut-out, permanent magnet type.

Trade Announcement.—Messrs. Shoolbred and Connell, engineers and electricians, announce that their only address is now 11, Cheapside, Luton, Beds., and all communications should be addressed there.

Holidays.—Messrs. Cryselco, Ltd., of Bedford, have their works closed from the 24th inst., until Monday morning, the 30th inst.

The London Electric Firm, of Croydon, announce that their works are closed until Monday morning next, December 30th, for holidays.

Patent Restoration.—An order has been made restoring patent No. 5,542, of 1900, granted to C. Darrah, jun., and J. G. Patterson, for "Improvements in safety devices for miners' safety lamps."

Dissolutions and Liquidations.—The Marzi Loud-Speaking Telephone Co., Ltd.—This company is winding up with Mr. A. D. Foggo, 11, Queen Victoria Street, London, E.C., as liquidator. A meeting of creditors is called for January 4th. They are required to send particulars of debts, &c., to Mr. Foggo, by February 1st.

Electric Flash Lights, Ltd.—This company is winding up voluntarily with Mr. R. G. Sidford, 20, John Street, Adelphi, W.C., as liquidator. A meeting of creditors is called for December 30th.

Cowper-Coles Galvanising Syndicate, Ltd.—A meeting is called for January 23rd at 11, Ironmonger Lane, E.C., to hear an account of the winding up from Mr. A. E. Tugwood, the liquidator.

The Reflector Syndicate, Ltd.—A meeting of this company is called for the same time and place for a similar purpose.

Langdon-Davies Motor Co., Ltd.—A meeting is called for January 22nd at 12, Coleman Street, E.C., to hear an account of the winding up from the liquidator, Mr. C. Cape.

Bankruptcy Proceedings.—W. F. Flint, electrical engineer, Hull.—Release of trustee (W. G. Hall), November 28th.

Mexico: Leaving the Field Without Fight.—The following letter has just appeared in the *Glasgow Daily Herald*:—

"Servicio Consular Mexicano,
"116, Hope Street, Glasgow, December 14th.

"Sir,—I beg space in your important paper for these few remarks, calling the attention of the merchants who received from me an invitation to participate in the local exhibition in the State of Colima, Mexico, towards the not very despicable fact that those not availing themselves of that kind of advertisement really miss a good opportunity to introduce their products in a new market, leaving the field without fight to other very enterprising competitors, a very considerable factor for commercial supremacy. As the expense would not be ruinous for those wishing to send samples to that Exhibition, it would be desirable for me to know how many of them are they, so that the steamship company could give the capacity required for freight up to Puerto Mexico, in the Gulf of Mexico.—I am, &c.,

"Miguel Barrera, *Consul for Mexico.*"

Meters Approved.—According to the *London Gazette* for December 20th, the Board of Trade has approved of the following meters:—

Rex meter, type S.G. 1, deposited April 16th, 1912, on behalf of the Société Genevoise, Geneva, for constant-pressure S.P. two-wire A.C.

Bat Meter type H, deposited February 23rd, 1912, by the Bat Meter Co., Ltd., for constant pressure two-wire C.C.

Calendars and Diaries.—From the Union Electric Co., Ltd., of Park Street, Southwark, London, S.E., we have received an interesting wall calendar for 1913, the outstanding feature of which is a Union motor with pulley and belt-driving machinery, executed in colour. This cannot help effectively driving home the power side of the firm's business. Neat monthly date sheets are interleaved with illustrations of Union apparatus. As only a limited number of the calendars are available, applications should be sent in at once. It is intended later to issue the card itself as a showcard.

Mr. John Whitelaw, of 15A, Duncan Street, Edinburgh, has sent us a serviceable monthly sheet wall calendar for 1913, lighting-up times being indicated in small red figures. The upper half of each sheet has a "Highways and Byways" picture appropriate to the month—"Ploughing in Hope," "A Halt in the Lane," "Springtime's Bounty," and so on.

As a Christmas souvenir the St. Helens Cable and Rubber Co., Ltd., of Warrington, are sending out to their friends a small desk-card, "Lest ye Forget," with small monthly date slips for 1913.

Messrs. Geo. M'Cartney & Co., makers of Orb switchgear, Cumnock, N.B., have brought out a serviceable calendar for the coming year, with clearly-printed dates on monthly sheets.

The Brimsdown Lamp Works Ltd., Kingsway House, W.C.—A neat little calendar and postage stamp case has been received from this firm, together with a pack of playing cards ornamented on the backs with a reproduction of the familiar poster recording the world-wide popularity of the well-known "Wirum" lamps.

To the Electric Construction Co., Ltd., for whose New Year souvenir we always look with interest, we are indebted for a very neat and handy vest-pocket diary and stamp-case, together with a pocket wire gauge—a nickel-plated gem.

LIGHTING and POWER NOTES.

Australia.—The following interesting notes show the progress that is being made by the Newcastle City Council electrical department:—The reconstruction scheme which has been in hand for the greater part of this year is now nearing completion. Two-thirds of the entire mains for the city have been reconstructed and completed; new high-pressure feeders have been erected to the city sub-station, which is an entirely new building, containing three banks of transformers with high and low-tension switchgear, suitably housed in a three-storey fireproof building. The top portion of same contains the switch-gear, the middle section the transformers, and the bottom section the cables from the switchgear to the transformers. New low-tension feeders have been erected in the main streets, which will increase the carrying capacity. The new General Electric Co.'s series incandescent system single lamps of 60 C.P. is now partly installed with gratifying results. The water-softening plant, which is of Kennicott type, has been delivered and erected by the contractors, and is now in operation. The condensing plant, which embraces a multi-jet condenser of Mirrlees-Leblanc type, is partly erected, with the oil eliminating plant, and the spray cooler as designed by Messrs. Fyvie & Stewart, of Melbourne. Two other sub-stations are in course of erection and will be in operation early in the new year. The mains have been extended into the municipality of Hamilton and Wickham, and a third municipality is now negotiating street lighting, which will also give the Council the right of private supply.

The financial results of the first half of this year under the present management, as compared with the first half of 1911, show a net difference of £1,600, despite the fact that during this year a considerable sum has been spent from revenue for reconstruction purposes, and to date the undertaking has not received the full benefit of the extra £10,000 that is now being spent, which will be reflected in largely increased business, and greatly decreased working costs. It is expected that the system will be completely in order during the first few months of the new year. Mr. Guy Allbut is the city electrical engineer.

Baildon.—The District Council decided last week to ask the B. of T. for a prov. order to construct electric tramways, and also for an Order under the Electric Lighting Acts. Negotiations are in progress with the Bradford Corporation with reference to the proposed tramway facilities.

Bolton.—The Electricity Committee has decided to supply current for motive power to the works of Messrs. Dobson and Barlow, Ltd., on terms to be arranged.

Bradford.—The Electricity Committee of the Corporation has decided to recommend the City Council to illuminate Tong Street—a long thoroughfare commencing at Dudley Hill and extending therefrom for over 1¼ miles to Westgate Hill—with electricity in place of gas.

Bradford-on-Avon.—The U.D.C. has deferred the electric light question, broached by Messrs. Purves, of Exeter, until the new Council is elected next April.

Bridlington.—The T.C. on December 18th decided to apply to the L.G.B. for a loan of £5,000 for the provision of new generating plant of 600-KW. capacity and extensions to the engine room.

Canada.—The New Westminster (B.C.) Power Co. is about to obtain extensive water rights on Brandt Creek, Indian River, Young Lake and Norton Lake, waters contiguous to the city. The object of the company is to establish a power plant to supply the Fraser Valley district with current for lighting and power purposes. The New Westminster Power Co. is composed of a number of local parties backed by English capital.

Chesham.—The U.D.C. has entered into a seven years' agreement for public lighting with the local electricity company.

China.—The establishment of generating stations has made great strides in China in recent years. Besides Shanghai, the use of electricity has extended to all the large cities in the surrounding districts—Hangchow, Ningpo, Soochow, Chingkiang and Wousih. Four-fifths of these undertakings are, says *La Revue Pratique de l'Electricité*, in the hands of German firms, whose sale prices defy all competition.

Chorley.—A Bradford firm have taken land for a new cotton mill to be erected in Chorley, and to accommodate 700 looms. It will be the first shed in this locality to be electrically-driven.

Chorley Wood.—The Watford U.D.C. has, in view of the formation of an Urban Council for Chorley Wood, deferred the question of the electric light scheme included in a prov. order being applied for by a private company. The draft order provides that the local authority shall have the option of purchasing the undertaking at the end of 21 years, and each subsequent seven years.

Cleckheaton (Yorks.).—At the last meeting of the District Council it was decided to confirm the recommendation of the Electricity Committee that the prices for electricity should be advanced by 10 per cent., except in cases where the supply is under agreement. This increase is a result of the enhanced prices of coal.

GERMANY.—The monopolist tendencies of the large electric construction and supply companies in Germany are generally resented, and in Schleswig-Holstein some nine districts have banded themselves together in an electric Zweckverband, with the object of safeguarding the interests of its members in all questions relating to the supply of their districts with electric current. The Verband will not itself carry out installations, but will confine its operations to tendering advice and clearing the ground for private initiative. The departure is expected to prove a boon to the smaller electrical manufacturing firms who have hitherto been excluded from participation when schemes were launched by any of the monopolist companies.

HOLLAND.—Several schemes for the establishment of generating stations are being considered in Holland. One station is planned to serve the Communes of Nieuw Buinen, Buinerveen, Cosselle and Gieten in the province of Drenthe; a second is for the supply of the Communes of Wondsen, Ijlst and Balk in Friesland, and a third for Giekerk, Molesend and Roodkerk, also in Friesland.—*Revue Pratique de l'Electricité.*

Cwmavon.—The U.D.C. has decided to apply to the B. of T. for a prov. order for electric lighting; exclusive of the cost of the site for the generating station, the cost of the scheme is placed at £6,000.

Fife.—The Fife Electric Power Co. has acquired a site in Nethertown, at the south side of Dunfermline, for the purpose of erecting a sub-station, in order that power may be better transmitted to the Rosyth area.

Finchley.—At the last meeting of the Council, the Electricity Committee reported that it had considered a special report of the electrical engineer on the matter of the cheaper production of electricity, and recommended that tenders be invited for the installation of an oil engine at the electricity works at an estimated cost of £4,500. The report was adopted.

Fleetwood.—The U.D.C. has decided to apply to the L.G.B. for sanction to borrow £7,176 to meet the cost of proposed extensions at the electricity works, and to request that permission may be given for the work to be proceeded with.

Hornsey.—The Council has decided to ensure the electricity works against loss of profits in the case of fire or explosion. According to the statement of the working of the electricity department for the half-year ended September 31st last, it appears that the amount received from private consumers had been £6,987, an increase of £435 over the corresponding period. The total receipts were £7,799, as against £7,334, or an increase of £465. With regard to the expenditure, this had been £4,456, as against £3,730 at the corresponding period.

Huddersfield.—The Corporation has decided to apply to the L.G.B. for powers to borrow £60,000 for the purposes of the local electricity undertaking, to which a number of detailed improvements are proposed to be made, including some alterations to the buildings, and the fixing of new single-phase switchgear.

King's Lynn.—At a recent meeting of the T.C., the chairman of the Electricity Committee stated that the Committee felt the time had come when considerable outlay must be made on extension of plant. This was owing to the large number of fresh customers who had lately been obtained, several of them being large consumers. They include the Great Eastern Railway Co., which has introduced electricity in the place of gas at the passenger station, and also lighted the harbour sidings. The total private connections are now equivalent to 41,591 lamps of 8 C.P., and this in a town with a population of 20,000. In addition, all the streets are electrically lighted.

London.—The Bethnal Green Council has decided to adopt the electricity supply proposals, particulars of which were given in our last issue.

Mexborough.—The Council has decided to apply to the L.G.B. for powers to borrow £10,000 to be devoted to the extension of the local electricity works.

New Zealand.—The Council of Devonport, New Zealand, is inviting schemes, for adoption by the Municipality or for execution by private enterprise, for the installation of electric lighting in the town. Full details are required, including, in schemes for private enterprise, the charges that would be made for the supply of current and what share of profits would be given to the local authority.—*Financier.*

Salford.—A fire broke out at Salford electricity works early last Thursday. The extent of the damage is estimated at £10,000, including the destruction of a switchboard which will cost £5,000 to replace. It is stated that the fire was caused by a workman dropping a spanner which in its fall came in contact with a live wire. There was a great blaze, and the fire extended rapidly, destroying many cables. The fire brigade were able to prevent serious damage being done to the electrical machinery. The tramway service had to be suspended for several hours, but the co-operation of the Manchester, Bury and Eccles electrical systems greatly minimised the dislocation. Some of the larger works which depend entirely upon electricity for their motive power have been compelled to close until the damage at the electricity station is repaired.

South Africa.—At a public meeting recently held, the Harrismith, O.F.S. Municipality were authorised to raise a loan for the carrying out of a hydro-electric scheme. The power will be generated by water supply on the top of Platberg mountain, and used for the lighting of the town, and supplying power for industries. This scheme, it is supposed, will be the first of its type in the country.

Swinton and Pendlebury.—At a meeting of the D.C., held last week, a letter was read from the Lancashire Electric Power Co., stating that it had arranged, subject to the consent of the Council, to supply Messrs. A. Knowles & Sons, Ltd., with current for haulage purposes, principally at the Pendlebury and Clifton Hall Collieries. The present requirements were about 320 H.P. at Pendlebury, and 250 H.P. at Clifton Hall. It was resolved that the Council consent to the arrangement.

Wood Green.—The District Council is one of the few local authorities round London which has no electric supply in its district, with the result that the largest firms generate their own energy. About 12 years ago Wood Green and four contiguous districts combined in a proposed scheme of generation and distribution, but in the end that fell through. Six or seven years ago Wood Green decided to embark on a scheme of its own, involving an outlay of £60,000. The L.G.B., however, refused to sanction the application for a loan. Then the District Council obtained a provisional order, which was from time to time extended. Now the Council has another scheme on foot—viz., to sell the order outright to the Tottenham and Edmonton Gas Co., and, with that aim in view, the company, with the sanction of the local authority, is promoting a Bill in Parliament in the ensuing session. The company has agreed to pay the Council the sum of £500, together with the full amount of its costs and charges incurred in applying to Parliament for the necessary powers, and to commence a supply of electricity within a period of 12 months from the date of the transfer of the order. The actual prices to be charged are limited for lighting purposes (private consumers) to 5d. per unit; for power, heat and domestic purposes (private consumers) to 2d. per unit; for street lighting, 2½d. per unit in roads or streets in which houses are being supplied by the company. The Council will have the right at any time after the expiration of 14 years to purchase the undertaking upon payment of the capital expenditure, and, in addition, a sum calculated on that capital expenditure at rates ranging from 20 per cent. if the purchase is made in the fifteenth year, the percentage decreasing 1 per cent. on each additional year's purchase. In the course of a discussion on the subject, Councillor Holmes said it might be useless to oppose the scheme, but he should do his very best to prevent one company obtaining a monopoly of both electric and gas lighting in the town. The present automatic gas lighting was bad. Councillor Davies said the automatic gas lighting was experimental, and it was improving. The Council signified its approval of the scheme.

The North Metropolitan Power Supply Co. has also given the Council notice of its intention to apply for a provisional order for Wood Green.

West Kirkby.—The Electricity Supply Committee of the U.D.C. has reported that for the year's working up to November 30th last there was a profit on the undertaking of £116.

The L.G.B. has sanctioned the borrowing of £1,157 and £168 for the purposes of the electric light undertaking.

West Wickham.—The Beckenham U.D.C. proposes to apply to the B. of T. for a prov. order for electric supply at West Wickham, which is in the area of the Bromley R.D.C.

Wisbech.—The B. of T. has forwarded to the T.C. an application from the National Electric Construction Co., for its E.L. Order to be extended, and not revoked. The Council has referred the matter to a Committee for consideration.

Southend-on-Sea.—The T.C. has decided to apply to the L.G.B. for a loan of £11,000 for additional plant, &c., at the electricity works. It is proposed to install two new Babcock boilers, with economisers, feed pumps, and an automatic coal and ash conveyor.

Willesden.—In considering the proposed improvements in the public street lighting, the Electricity Committee is to be given an opportunity of submitting tenders in competition with the gas company.

South Africa.—According to the *South African Mining Journal* an application to amend its licence by the Victoria Falls Power Co., and any objections thereto, was to be heard in public by the Power Undertakings Board on December 17th, at the office of the Government mining engineer, Johannesburg.

RHODESIA.—The Lone Hand mine on the Tuli River is installing machinery with electricity for motive power. An overhead railway has been erected between the pit head and the mill, and a powerful pump, driven by electricity, has been placed in the river bed. Prospects are held to be most promising.

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MESSRS. J. SADD & SONS' TIMBER MILLS AT MALDON, ESSEX.

Messrs. Sadd & Sons, Ltd., can claim to be one of the most progressive firms engaged in the timber trade in the Eastern Counties, if not in the whole country. Their history, from the establishment of the business about 150 years ago to its conversion into a limited liability company in the year 1889, is a record of steady, natural growth. The firm made great strides under the guidance of its late head, Mr. John Granger Sadd, J.P., who was five times Mayor of Maldon, but the most noteworthy developments have occurred since the mill was burnt down three years ago.

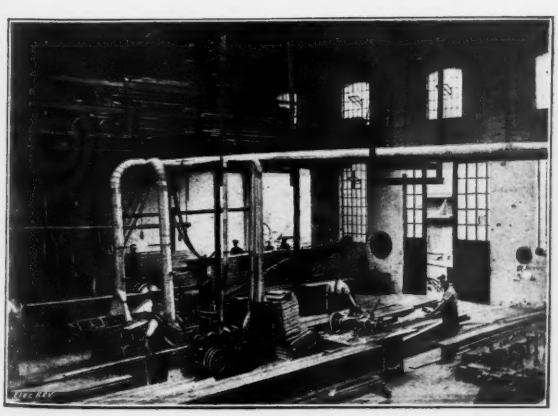
The opportunity which this afforded for a complete reorganisation and layout on modern lines was immediately realised, and since that event an immense amount of careful thought has been devoted to every detail of construction and operation of all the machinery, both mechanical and commercial, which is vital to the welfare of a successful concern.

General View of the Timber Mills.

After the death of Mr. J. G. Sadd the management devolved upon the three present directors, Messrs. John, Harry and Herbert Sadd, and Mr. Alfred Thorn, who has just resigned after 45 years' service.

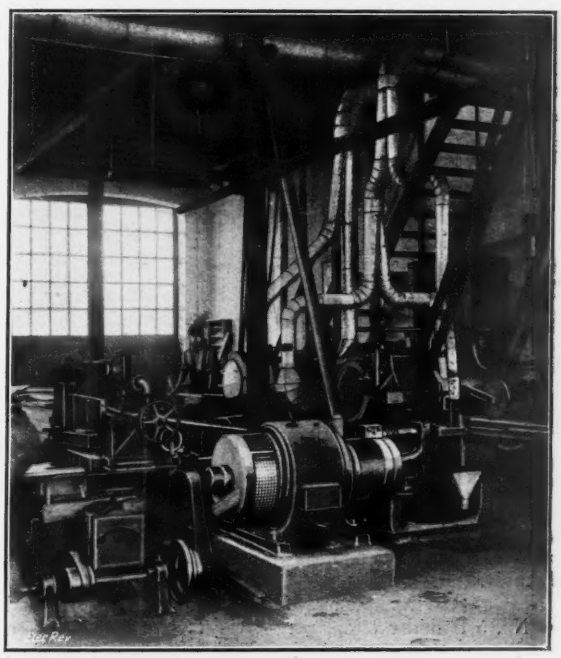
The work naturally divides itself up into four sections :— The foreign timber trade, the English timber trade, the engineering plant, and the secretarial duties. Each of the four directors had received a training specially fitting him for one of these branches in particular, and in the order named.

The foreign timber trade, which is under the special care of Mr. John Sadd, now involves a capital of about £30,000. and includes the purchase and resale of all squared-up imported timber and its conversion into suitable scantlings to meet the builders' requirements. Practically the whole of this timber is brought up the Blackwater by steamers of about 1,000 tons, and delivered to the extensive yards, which are well covered with lofty sheds, containing at all times large stocks of Swedish and Russian timber ; this is seasoned under very favourable conditions, and afterwards transported to the Foreign Mill, siding, or barge by gravity feed conveyors.



Part of the Foreign Timber Mill and Joinery Loft.

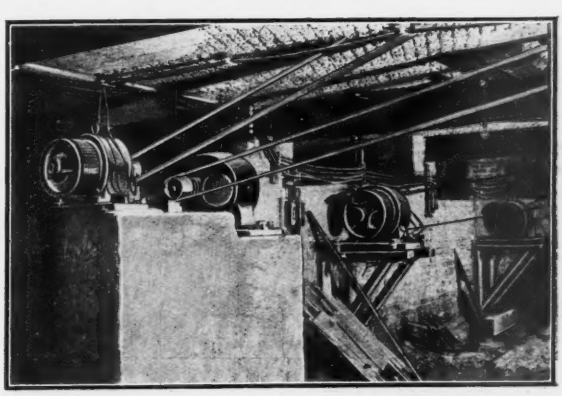
This Foreign Mill has been built upon the site of the old mill, which previously to the fire dealt with both English and foreign timber, and was much handicapped by lack of space and modern conveniences. It is constructed of brick with reinforced concrete floor, to minimise the danger of fire. A second floor of lighter construction is utilised for joinery manufacture. The whole is covered by an Anderson lattice girder roof of 64 ft. span, with a skylight giving an excellently distributed light in the daytime ;



American Planer Driven by 50-h.p. Crompton Motor.

electric arc and incandescent lamps perform this duty at night. The mill is provided with an excellent equipment of machinery.

The largest machine is a No. 77 eight-cutter planer and moulder, by the American Woodworking Machinery Co., U.S.A., driven by a 50-h.p. Crompton compound-wound interpole motor, and needs about eight men to keep it supplied with raw material and to remove that which has passed through it. This amount of labour is being reduced by the installation of runways from the timber storage sheds to the finished goods warehouse, or direct to the railway siding or river.



Motors on Concrete Piers in the Basement.

The cutters are designed upon the pencil-sharpener principle, and consist of thin knives of high-speed steel, firmly secured to a cylindrical hub at the best cutting angle. Mechanism is provided for "jointing" these knives in position, and they are afterwards ground up to the best

angle for the stock upon which they are to be used by a double-wheel automatic grinder, specially designed for the purpose by the same firm, and driven by a small 2-H.P. motor attached to the ceiling. The whole of the cutters are driven by belts kept at a suitable and uniform tension by means of adjustable jockey pulleys, the two main cutters being driven from both ends.

For lighter work, a Bolinder No. 7B planing and moulding machine has been installed, with six rotary cutters, and fixed knives top and bottom, to ensure a perfect finish. This machine is capable of turning out about 20,000 ft. of matching in an ordinary day's run, and is driven by a 24-H.P. Crompton motor, placed under the floor, to which a Sandycroft liquid starter has been applied with very satisactory results. To this machine has been fitted the Miles

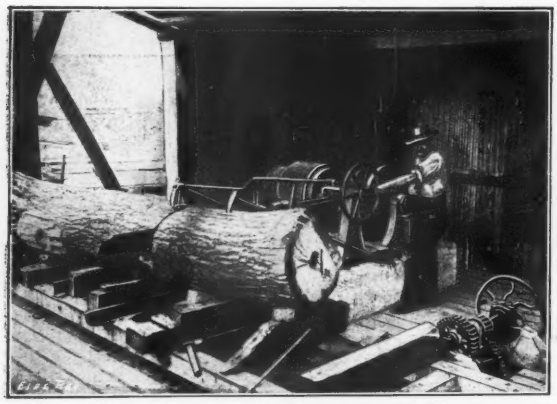
Electric Gantry in Timber Yard.

patent attachment, enabling the stock to be split and planed or moulded on the two inner faces simultaneously with the other six.

Next to this machine and feeding from the opposite end is a No. 5 Bolinder circular re-saw, which is capable of a very large output and easily keeps the above planer supplied with freshly sawn timber. It has three speeds of feed, operated by a feed roller which is readily turned out of the way when not required.

In addition to these there is a very complete equipment of minor machines of modern design, each driven by a separate Crompton motor, the whole electrical installation being below the floor on concrete piers in a roomy basement about 7 ft. high, which enables it to be inspected or attended to without disturbing the workmen.

The first floor is occupied by a turning and joinery department, which, though only recently established, is



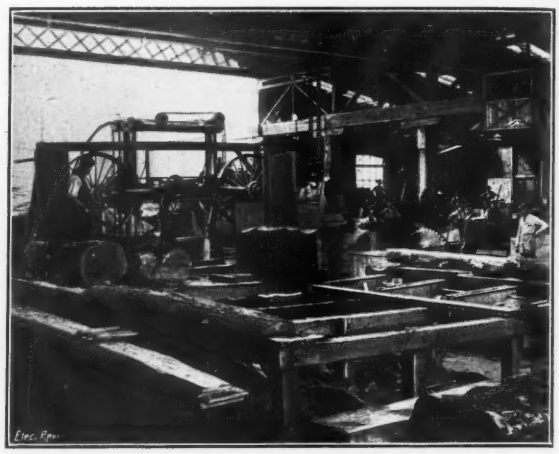
Ransome Cross-Cut Saw and 8-H.P. Slow-Speed Crompton Motor.

proving itself to be a very promising branch of the industry. The plant comprises drum, radial-arm and belt sanders, vertical spindle and panel planers, tenoning, morticing, and boring machines, and copying and other lathes. All these machines are motor-driven, electricity being further utilised for heating glue kettles and for lighting purposes.

The whole of the refuse from this mill is removed by means of a pneumatic installation operated by a 25-H.P. motor, part being deposited on the producer house charging floor, and the surplus on a dump heap well away from the mill.

This department also handles all classes of builders' material such as slates, tiles, drain pipes, cement, roofing felt, sideroleum, and tar of all descriptions, the demand for treated timber being met by a creosoting plant recently installed.

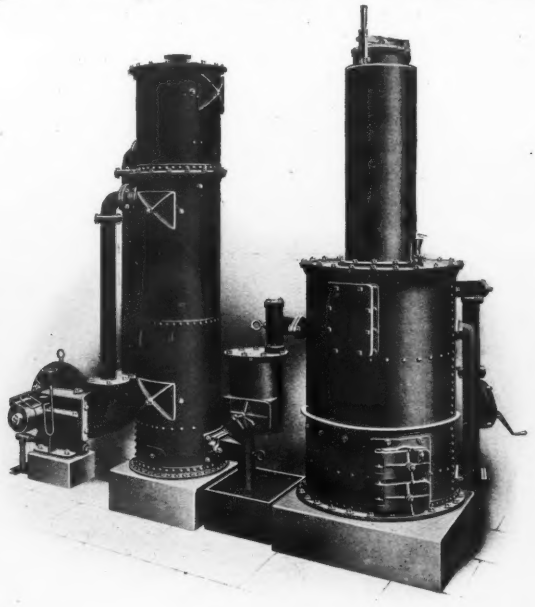
The English mill, before the fire, was much handicapped



Ransome Horizontal Band-Saw with Lancashire Motor Built on R H. Wheel Axle.

by lack of room. It was therefore decided to put up a second mill at the opposite end of the yard, the employment of electric power alone making this arrangement practicable. This gives ample yard room and storage space round each mill for the class of timber for which it is designed.

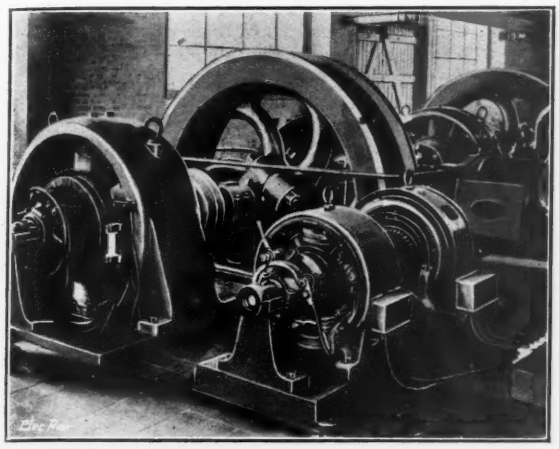
The building is of timber and corrugated iron, and is fitted with an "Anderson" roof of 54 ft. span, with a 37-ft. span lean-to on the one side to accommodate the lighter machinery, and a smaller lean-to on the other side



Crossley Wood Refuse Gas Plant.

used as a sharpening shop. The main building has open ends to admit of the unhampered use of the 3-motor H.M. and B. electric traveller of 5 tons' capacity, with a 50-ft. span, running on a timber gantry 200 ft. in extent. The height of the gantry above the ground is 22 ft., and the whole of the laying ground beneath it is utilised to its utmost capacity with oak, elm and ash timber as it is brought in by road, rail or water.

The logs are first cut off to the dead length required by a



Power House, showing Crompton Generators and Automatic Booster.

Ransome reciprocating cross-cut saw, which is direct coupled to a low-speed 8-H.P. Crompton motor running at 220 R.P.M. It is capable of dealing with logsup to 5 ft. diameter, which are placed on a geared travelling carriage to facilitate rapid and accurate adjustment.

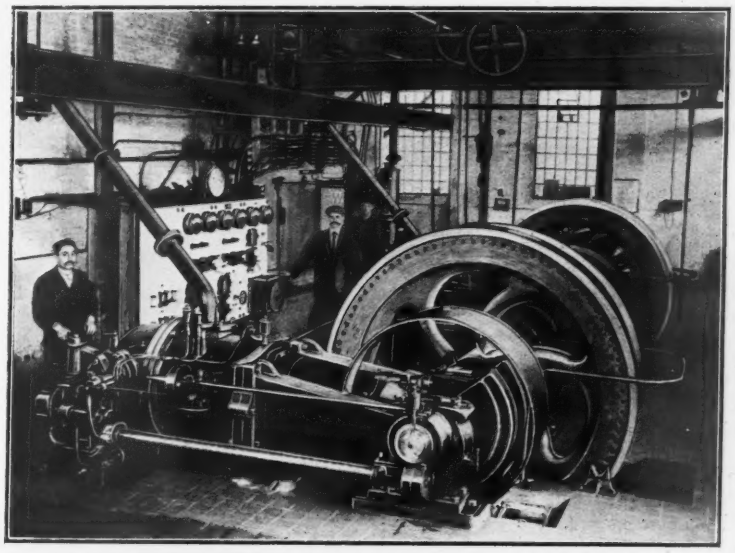
The main feature of this mill is the No. 1 Ransome and Lavo type horizontal band-saw, nominally capable of handling timber 5 ft. in diam. or 4 ft. sq., by unlimited length on account of the open-ended building. It has actually dealt with a pollard oak 8 ft. × 5 ft. × about 20 ft. long, cutting it into planks of suitable thickness with perfect satisfaction, and without any special gear being required. This machine is driven by a 35-H.P. Lancashire enclosed fan ventilated motor, the feed works and gear for raising and lowering the saw being operated by a separate 12-H.P. motor of the same make. The capacity of this machine is remarkable, 10,000 ft. super. per day being quite easily dealt with.

The less valuable timber is broken down at the Lane Rack bench, which has a 5-ft. hoe inserted-tooth saw, and is driven by a 75-H.P. Crompton motor. The planks so produced are converted into boards at a 54-inch Clement vertical band re-saw, marketed by the American Woodworking Manufactory Co. It possesses several advantageous adjustments, the whole of the feed rolls being on a movable bed, which enables them to be canted to any desired angle for the cutting of feather-edged boards. All the feed rolls are power-driven, thus producing constant feed, which can be modified at will by means of patent variable gear.

In the lean-to are placed four circular saw benches, one swing and one pendulum cross-cut, 36-in. band-saw, and a large hollow chisel mortising machine, all of which are driven by separate Crompton motors from 4 to 16 H.P.

The refuse from this mill is removed by a motor-driven conveyor and elevator and discharged into a large hopper, high enough for a cart to come under the chute.

The power plant, which was arranged and installed by Mr. H. P. Girling, M.I.E.E., consists of two 100-H.P. sets with space for a third. It is run entirely from wood refuse, which is produced on the premises in sufficient quantity to supply about 1,000 H.P. if required. Each set consists of a No. 6 Crossley gas plant, and Z.E. type horizontal low-speed



Crossley Gas Engines in the Power House.

engine running at 200 R.P.M., direct-coupled to a Crompton 63-KW. D.C. multipolar, compound-wound, interpole generator by means of a Zodel Voith flexible coupling.

The wood-refuse gas plants, which were among the first of their class to be installed on a satisfactory basis, have proved to be very efficient and give the utmost satisfaction; they are connected to a bus-pipe through wheel valves, and both engines have been run simultaneously from one plant for a period of over one month, which shows that they are very generously designed. Although they are arranged for the injection of water vapour as in the case of anthracite plants, this has been found unnecessary, owing to the large amount of natural moisture in the refuse.

The gas is first passed through a dust-collecting box over a water seal, and then up through a coke scrubber and afterwards through a centrifugal motor-driven tar extractor to the wood-wool scrubber, and thence to the bus-pipe.

The gas produced is of such excellent quality that the engines, though, like most gas engines, only designed to give

View of Horizontal Band-Saw, showing Motor on Wheel Axle.

90 per cent. of their nominal output continuously, will and do with perfect freedom give the full 100 B.H.P. each for considerable periods.

The engines are governed on the hit-and-miss principle, the variation in speed being so small that a perfectly steady voltage is maintained at the bus-bars. This desirable end is considerably facilitated by the very heavy fly-wheels, one of which, weighing about 9 tons, is fitted to each engine. The exhaust valves are water cooled and the exhaust valves and piston are lubricated by forced feed.

The generators run absolutely sparklessly at all loads up to 25 per cent. overload without brush shifting, and will easily do 50 per cent. overload for short periods and 100 per cent. momentarily without dangerous sparking or overheating.

The engines are now assisted by a battery consisting of 112 P21 E.P.S. cells of 1,200-ampere-hour capacity, capable of giving 1,000 amperes momentarily, and a fully automatic reversible Crompton booster designed to deal with the maximum output of the battery. By this means, the engines can be kept at full load in spite of the exceedingly variable station output, which is characteristic of all timber mills. The nature of the peaks to be dealt with can easily be imagined when the fact is borne in mind that the plant deals satisfactorily with 500 aggregate H.P. of motors of varying size up to 75 H.P., in addition to lighting and town supply.

The switchboard supplied by Messrs. Crompton and Co. consists of nine panels, one for each generator, three for booster and battery, and four distributing panels. It is designed to be as nearly fool-proof as possible, and includes eight heavy-current automatic circuit-breakers, dead-beat meters, integrating watt-meters in all outgoing mains, and a recording central zero ammeter in the battery circuit.

The three-way battery and booster switch, the booster motor starter and automatic circuit breakers are all fitted with auxiliary trip switches as specified by the designer, so that no harm can result from the attendant accidentally operating the wrong switch other than the opening of the battery circuit-breaker, which is fitted with a similar auxiliary switch and coil. The generator circuit-breakers are of course fitted with reverse coils to facilitate parallel running, and the compound winding is never cut out. There is never the least inclination for the generators to pump.

A 10-ton overhead traveller has been erected to cover the whole of the engines.

The lighting of the mills and the extensive yards and sheds is accomplished by 20 arc lamps and numerous incandescent lamps. This lighting proved so satisfactory that the directors decided to extend it to their own homes, some half a mile away, by overhead wires. Wayleaves were readily granted by the owners of property *en route*. This led to a number of applications for supply from other parts of the town, and current is now available throughout the whole of Maldon and also the adjoining village of Heybridge. The total output for the year ended September, 1912, including power and heat and light, was 275,000 units, and it is growing all the time.

Electricity for heating purposes is being very favourably received in the town. One consumer has been cooking over 100 dinners a day electrically, and considers the quality of the cooking quite equal to that obtained by the much-advertised paper bag system. Besides the usual heating apparatus, automatically-regulated incubators are in use in the town. The first service water heater is now in operation, and several others are shortly to be installed.

As regards the last, but by no means least important, department—the office—this is now being completely reorganised and extended with the aid of the new secretary, Mr. W. Ives, who is thoroughly conversant with the most approved modern systems of office management and cost keeping.

We are indebted for the photographs and particulars embodied in the foregoing article to the engineer and contractor for the installation, Mr. H. P. Girling, M.I.E.E.

LIVERPOOL'S NEW ELECTRICAL ENGINEER.

Mr. Harold Dickinson, A.M.Inst.C.E., M.I.E.E., M.I.Mech.E., engineer and manager of the Leeds Corporation electric supply undertaking, will shortly leave Leeds to take up the post of electrical engineer for Liverpool.

H. Dickinson, M.I.E.E.

Educated at Tettenhall College, near Wolverhampton, he left there in 1883, and served a pupilage of three years in the workshops of Messrs. Elwell-Parker, Ltd., electrical and mechanical engineers (afterwards formed into the Electrical Construction Co., Ltd.). Following that Mr. Dickinson took a three years' course in electrical and mechanical engineering at Mason's College, Birmingham. From 1899 to 1890 he occupied the post of electrician with the House-to-House Electric Light Supply Co., Ltd., now the Brompton and Kensington Electric Supply Co., Ltd. The next year he was appointed assistant electrical engineer to the Electricity Supply Co. for Spain, Ltd., and was engaged in superintending the construction of the Madrid electricity works and the laying of mains. Mr. Dickinson was, from 1891 to 1893, electrical engineer for Messrs. Hammond and Co. for the construction of the Dublin Electricity Works and the laying of mains, and had control of the running of the works until they were taken over over by the Dublin Corporation. The following 19 years of his professional labours were spent in Leeds, the first five as engineer and manager of the Leeds Electric Supply undertaking for the Yorkshire House-to-House Electricity Co., Ltd. When the company's business was bought by the Corporation in 1898, Mr. Dickinson was retained, and he has occupied the post up to the present time.

From the commencement, when Mr. Dickinson was appointed engineer and manager of the Leeds Electric Supply Undertaking, he has been responsible for the design and construction of the generating works and mains and for the reorganisation of the works, as well as for the administration of the undertaking.

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During his 19 years in Leeds, Mr. Dickinson, through his courtesy and kindness, has endeared himself to the hearts of the members of his staff, the City Council, and all those with whom he came into contact, and whilst they keenly regret his departure, nevertheless at the same time he has their best wishes for his prosperity at Liverpool.—S. R. C.

NOTES FROM CANADA.

[FROM OUR SPECIAL CORRESPONDENT.]

THE doings of the Hydro-Electric Power Commission are again before the people of Ontario on account of a further reduction in rates. Only a few weeks ago the fact that substantial reductions were being made to take effect on November 1st last, was recorded in these notes, but in going over the new rates on the basis of the load for November, it was found that the cost of power could be brought still lower. The total saving to the municipalities due to the decreased price of power will be about £20,000 in the year to come. The new rate for Toronto, which takes very nearly one-half of the total power supplied by the Commission, is equal to £3 2s. 6d. per H.P. per year, and covers all charges, including capital costs, maintenance, depreciation and sinking fund. From present indications, it is not at all unlikely that a further reduction in power cost can and will be made in six months' time. In one case the rates have been increased, and in four others they are unaltered, but all the remaining municipalities will obtain cheaper power than before.

In addition to the dealings of the Commission with the municipalities, there are those of the latter with their customers to be considered, and it is gratifying to learn that most of the towns and villages are already doing business on a paying basis.

The Eastern Canada Power Co., which was formed some time ago, and has not since been heard of, is coming to the front again. It is said that it proposes to build a very large dam across the St. Lawrence, near the Catean, Cedar, Split Rock and Cascade Rapids, a few miles south-west of Montreal. The rapids themselves will disappear, as the water-level will be raised to that of Lake St. Francis a little higher up the river. This scheme will provide 1,000,000 H.P. according to estimates.

The city engineer of Moose Jaw, Saskatchewan, has proposed the erection of a power plant on the site of some coal mines a few miles from the town, with the object of transmitting power, at high voltage, into the town.

The New Westminster Power Co., B.C., are going to apply for water rights in order that they may erect a power plant to supply the Fraser valley district.

At St. Catherines, Ontario, a large power house is to be erected by the Niagara, St. Catherines and Toronto Railway.

The Dominion Government has been investigating the lignite deposits of Saskatchewan, and it is now reported that some 2,000 million tons of this fuel are available, in the southern part of the province, for power purposes.

The dispatching of trains by telephones is growing rapidly in favour in this country. The C.P.R. has over 40 per cent. of its entire mileage equipped in this way, and other lines are adopting it very largely. In a recent paper read before the Western Canada Railway Club many advantages were claimed for the telephone over the telegraph, among them being a saving of time and labour, greater freedom from error, and that it is unaffected by wet and foggy weather, as is the case with the telegraph.

The Hobart (Tas.) Tramways.—In the Legislative Assembly, Mr. Ogden moved that the Government should take over the tramways owned and operated by the Hobart Electric Tramways Co. As was mentioned in a recent issue, the Assembly had previously rejected a Bill under which the City Council would have power to purchase the tramways, and a similar Bill has now been introduced in the Legislative Council. The voting was against the proposal.

TRAMWAY and RAILWAY NOTES.

Australia.—THE MELBOURNE RAILWAY ELECTRIFICATION.—The resolution providing for the electrification of the Melbourne suburban lines which was passed by the Legislative Assembly recently, has now been passed by the Legislative Council (Upper House) by 21 votes in favour to 6 against. The voting in the Lower House was 38 in favour—not 43, as mentioned in our last issue.

Bingley.—In connection with the proposal to borrow £43,500, the estimated cost of laying and equipping the tramway track, including the provision of the feeder cables, the D.C. will obtain the necessary powers, and the interest and sinking fund on the outlay will be paid by the Bradford Corporation.

Blackpool.—The "toast-rack" car has proved so popular that the Tramways Committee, on December 19th, decided to purchase another half-dozen, making the total number of these open cars 18. The cars will cost, with electrical fittings, about £575 each.

An experiment is being made in replacing the wooden seats of an old car with more comfortable rattan seats. If the experiment answers satisfactorily, the whole of the regular service cars will probably undergo a similar alteration.

The total receipts, from April 1st to December 4th, were £63,130, an advance of £5,884 compared with the same period last year.

Brighouse.—Much surprise has been caused by the decision of the Huddersfield Corporation not to proceed with the scheme for tramway connection with Brighouse. It had been generally expected that an attempt would be made to override the agreement arrived at between Brighouse and Halifax, giving the latter primary rights in Brighouse. This tramway question has been a very heated one for some time past in various parts of the district surrounding Huddersfield and Halifax, and in some places active hostility has been displayed to the proposals of the Halifax Corporation.

Canada.—A proposed new electric railway from Morrisburg, on the St. Lawrence River, to Ottawa, is having some difficulties with the city of Ottawa on the agreement for entrance. The company desires a 20-year agreement, but the city will grant only 12, this being the number of years which the Ottawa Electric Railway's franchise with the city has to run. The city will buy out the Ottawa Electric Railway, and wishes to avoid trouble with another railway occupying the streets of the city.

An electric railroad stretching from Winnipeg to Quebec, a distance of about 1,500 miles, and with seven points of contact with the great steam roads of the country, was the future outlined for the Porcupine Rand Belt Electric Railway at the directors meeting in Toronto. A charter has been granted for operations on 500 miles of road in Ontario, and applications have been made to allow construction of joining pieces of the line in Quebec and Manitoba. The road is to be equipped with storage battery cars each capable of running seven hours on a single charge. The power is to be obtained from the various water powers *en route*, and a number of small power plants will be built at various points along the line, where the batteries may be recharged.

Continental Notes.—FRANCE.—A bargain has been arranged between the Compagnie des Chemins de Fer du Midi and the French Government, whereby the former undertakes to build certain lines of railway declared "of public utility," on condition that the latter constructs two hydro-electric stations of 12,000 H.P. each. The Government has accepted the condition. The lines in question to be built are the Quillan to Mont Louis and the Quillan to Balesta. In addition, the company will build the Villefranche to Vernel, les Bains and Sahorre and the Bourg Madame to Latour de Carol lines. The stations to be built by the State will be situated at Porté and in the Carol Valley respectively.—*Revue Pratique de l'Electricité.*

SWITZERLAND.—For some considerable time the question has been discussed of the practicability of electrifying the Swiss Federal Railways. It appears that the Swiss railways are at present dependent upon the importation of fuel from abroad up to an amount approximating £1,000,000 annually. Experiments made in view of the working of the Lötschberg Railway by electric traction have shown that by utilising the available hydraulic power an economy of something like £30,000 to £40,000 per annum can be effected. The Committee entrusted with the investigation of electrifying the whole Federal system proposes to conduct operations in stages, commencing with those sections which can be most easily converted. Arrangements are already being made for the erection of an electric generating station at Amsteg in the Uri Canton. This station will be constructed and worked by the State, and the electrification operations are to be commenced on the Gothard line. The total expense of electrifying the whole Swiss Federal system is estimated at £20,000,000.

Crewe.—The T.C. has again under consideration the question of providing a tramway service. Several schemes have been mooted within the last 40 years, but they have never materialised. The latest proposal is to provide a railless traction system, which would undoubtedly be an improvement on the present horse 'buses

Doncaster.—Over 2,000 citizens have petitioned the Council to proceed with the work of tramway extension as soon as possible. The scheme is estimated to cost about £40,000, and it is contended that the outlay would be returned with profit in ten years.

Lancaster.—The traffic returns for November show 91,530 passengers and £343 receipts, against 89,097 passengers and £332 receipts in November, 1911. The Lancaster and District Tramway Co. is not proceeding with the proposal to apply electric or petrol traction to its line from Lancaster to Morecambe, now worked by horse cars.

Leeds.—It had been decided by the tramway men to take a ballot of both unionists and non-unionists on the question of withdrawing their labour until those recently dismissed or reduced were reinstated. In the result, the ballot was against a strike, and the matter has been dropped for the present.

Little Hulton.—After an agitation lasting for many years, the inhabitants are to have a tramway service from Walkden to Farnworth *via* Little Hulton. The negotiations between the D.C. and the South Lancashire Tramway Co. were broken off by the Tramways Co. about a fortnight ago, but the D.C. reopened them with the result that the Tramways Co. has given an undertaking to construct the tramways within the next 12 months. The D.C. has agreed to maintain the new track, in consideration of which the company will pay the D.C. £100 per annum for 33 years.

London.—The Bermondsey B.C. has decided not to consent to any but the conduit system for the proposed electrification of the existing horse tramway from Tower Bridge Road to Rotherhithe New Road.

Oldham.—The Tramways Committee decided on the 19th inst. to purchase two motor-omnibuses to be used as feeders to the cars.

Southport.—The Sub-Committee's report on the recommendations of Mr. C. W. Mallins on the tramway undertaking, was considered at a meeting on the 18th inst. It was decided to recommend to the T.C. that in future what is known as the inner circle should be discontinued, and that the cars should run from the town *via* Manchester Road to the corner of Ash Road and Scarisbrick Road, and back by the same route, instead of continuing the journey down Scarisbrick New Road; the number of cars would thus be reduced from four to two. Another recommendation was that the system of contract tickets be abolished from the end of the year, but allowing the present contracts to run on to the date of their expiration. Books containing 26 halfpenny tickets will still be issued.

TELEGRAPH and TELEPHONE NOTES.

Imperial Wireless System.—On December 17th the Select Committee on the Marconi agreement again examined Mr. Mr. C. Ll. Davies, solicitor to the Post Office, who prepared the draft agreement. He said there was nothing in the tender or draft agreement to decide what information the Postmaster-General should give to the company when obtaining their advice regarding new inventions; the Postmaster-General would decide what was necessary. If apparatus used were found to infringe someone's patents, and an injunction were obtained, the Post Office would be entitled to an indemnity from the company. The right of inspection would not be granted to the company unless the latter could show reasonable ground for suspicion that their patents were being infringed. He had no financial interest in the Marconi Co.

Mr. E. W. Farnall, assistant secretary to the Post Office, was also recalled. He stated that the conditions embodied in the tender had been settled in discussions between Mr. Godfrey Isaacs and himself. He had employed every argument that he could think of to induce Mr. Isaacs to lower his terms. He would not think it wise to give a contract to the Poulsen people. The question was becoming very urgent indeed; if some other country secured the commercial business, it would be very difficult to recover it. After hearing all the evidence, he thought the agreement was a better one than he at first supposed it to be. He had no interest in the Marconi Co.

Mr. R. Wilkins, chief clerk at the Treasury, said the royalty of 10 per cent. was the best figure the Post Office could secure, and he thought the Treasury was justified in agreeing to it. He was not surprised that the Technical Sub-Committee's report was not presented, but it would have been better to circulate it. He thought the clause objectionable which compelled the Government to pay full royalties until 1930 or 1940, irrespective of the number of Marconi patents in use.

On the 18th inst. letters from the Postmaster-General, showing that his relative, Mr. G. S. Montagu, had never held shares in the Marconi Co., though his name had been used *pro forma* in this connection on behalf of one of his firm's clients, were read. Sir George Reid then stated that in his previous evidence he had underrated the importance of the wireless stations at Fremantle and Sydney, and that he had no financial interest in the Marconi Co.

Mr. R. Wilkins's evidence was resumed, and he was questioned regarding the opinions expressed by his superiors with respect to the royalty of 10 per cent. The chairman having ruled that the questions must be answered, the Witness said that his superiors generally approved of the line he had taken. Regarding the detailed memoranda of the Department, which were called for, it was decided that the Treasury should be consulted as to their production. The Witness thought that the 10 per cent. royalty was a very decent bargain. He had no interest in the Marconi Co.

The case against the contract was then begun with the evidence of Sir Henry Norman, M.P., who said the ratification of the agreement would be against the public interest, as it would establish something like a monopoly for the Marconi Co. If it were ratified, inventors would either be unable to develop their ideas or would have to sell them to the company, and in that case the monopoly would be strengthened. To get rid of the Marconi patents would be an expensive and wasteful operation. It would be to the interest of both the company and the inventor of a new and improved system of wireless telegraphy that the latter should sell his rights to the former. The Marconi patents could quite well be dispensed with, and in any case the agreement was unnecessary, in view of Sec. 29 of the Patents and Designs Act. He disputed the urgency of the matter, and stated that during the past two years wireless telegraphy had made a revolutionary advance. The strategical needs of the North Sea, the Eastern Atlantic, and the Mediterranean were met by the Admiralty station at Malta which was about to be set in operation, and which would be in regular communication with the Admiralty stations in England. He saw no force in the argument that other countries might forestall the British system; moreover, other countries were not dependent upon the Marconi Co.

On the 19th inst. Sir Henry Norman expressed his views as to the scientific value of various wireless systems, discussing the spark, continuous wave and high-frequency generator systems. He considered that the Goldschmidt system would render wireless telegraphy possible over great distances, and that the signals would be untappable except with special apparatus. The continuous-wave system, he thought, must eventually supersede the spark system, and a few months would show whether one or other of the continuous-wave systems could fulfil the conditions of the Imperial service. He suggested that the Marconi Co. had not demonstrated their ability to carry out the contract. The agreement would not establish State-owned stations. He did not think the delay would be greater if some other system than the Marconi were adopted; the stations might still be completed by August, 1914, as provided under the agreement. He considered only the scientific side, not the commercial or financial aspect of the matter. The advantage of getting the best system would outweigh the disadvantages of further delay. If the agreement was not ratified, he supposed there would be nothing to prevent all the companies from combining except natural jealousy and the desire to be independent.

Sir G. C. Marks, M.P., who was the next witness, maintained that the wording of the agreement would allow all inventions and improvements made by the company to be classed as patents, whether patented or not, and therefore there would be no limit to the period during which the company could claim a monopoly, nor could the validity of the claim to such an invention be questioned. Hence the company would not need to take out patents while the agreement was running, nor would they be subject to the 14 years' limit. The whole equipment could be made dependent upon unpatented apparatus, so that the Postmaster-General could not free himself from the payment of royalty unless he removed everything from the stations. Inventors were working in the direction of dispensing with the high masts, and thus reducing the capital outlay very greatly. There was nothing in the agreement that would allow of a variation in the price if a different system were adopted, and for 28 years every new long-distance installation erected by the company would cost the Government £60,000.

The Committee adjourned until January 1st.

Train Dispatching by Telephone.—The system of dispatching trains by telephone has proved so satisfactory to the Canadian Pacific Railway that over 1,000 miles of telephone line are being put in this season. The C.P.R. is the second largest user of this method of dispatching trains in the world, and will soon be the largest. Practically all the main lines in the eastern division are now using this method, by means of which it is possible to get telephonic communication with any train on the line. Every train carries a long pole and telephone, which may be hooked to the wire along the right of way whenever the need arises.

Turkey.—The telephone installation in Constantinople has advanced so far that some 3,150 km. of wire are laid, the cast-iron pipe network having an extent of 30 km. At the present rate of progress it is expected that the system will be ready for inauguration by August next year. A European and an Asiatic district will be established, with 16 exchanges, three of them being of the largest size.—*Zeit. für Schwachstromtechnik.*

Suffragist Outrages.—A number of telephone wires in public call-boxes at Nottingham and in the Birmingham district were cut last week by suffragists.

CONTRACTS OPEN and CLOSED.

OPEN

Atherton.—January 29th. One E.H.T. switchboard and one H.T. switchboard for the U.D.C. See "Official Notices" to-day.

Australia.—VICTORIA.—January 24th. Two 4,000-KW. steam turbo-alternators, for the Melbourne City Council. See "Official Notices" November 22nd.

January 3rd.—1,100 opalescent arc lamp globes, for the Melbourne City Council. See "Official Notices" December 20th.

January 10th.—14,500 metal-filament lamps, for the Melbourne City Council. See "Official Notices" to-day.

January 28th.—Paper-insulated lead-covered cable for the P.M.G.'s department. See "Official Notices" December 20th.

February 21st.—Four 1,500-KW. rotary converters, for the Melbourne City Council. See "Official Notices" December 6th.

SYDNEY.—January 20th. Storage batteries, motor-generators and switchgear. City Electrical Engineer, Town Hall.

TASMANIA (HOBART).—January 13th. P.M.G.'s department:—Paper-insulated lead-covered cables. See "Official Notices" December 6th.

QUEENSLAND.—January 29th. Detectors (Schedule 242), for the P.M.G.'s Department. See "Official Notices" December 20th.

VICTORIA.—February 4th. Thirty-six Morse keys, for the P.M.G.'s Department. See "Official Notices" to-day.

WESTERN AUSTRALIA.—February 19th, 1913. Armoured telegraph cable, for the P.M.G.'s department. See "Official Notices" to-day.

Belfast.—January 1st. The Harbour Commissioners are inviting tenders for a 120-ton electric derrick crane at Alexandra wharf. Specifications, &c., from Mr. W. R. Kelly, Harbour Engineer, Harbour Offices, Belfast.

Belgium.—December 31st. La Société de l'Exposition Universelle et Internationale de Gand, 1913, (Rue des Moineaux) Ghent, are inviting tenders for the supply, laying and maintenance of the low-tension electric mains required in connection with the 1913 International Exhibition at Ghent.

Eastbourne.—January 14th, 1913. One 1,000-KW. horizontal steam turbine and alternator, without condensing plant, for the Corporation. See "Official Notices" December 20th.

France.—BOURGES (CHER).—January 16th. Tenders are invited for the supplying of two lots of electric cable, wire and accessories for the electric installation at the Bourges railway workshops. For further particulars see this column last week.

ROUEN.—January 7th. Tenders are required for the supply of electric lamps for the Théâtre des Arts and the municipal establishments for the year 1913, in two lots. Particulars from the Secrétariat de la Mairie, Bureau No. 8, Rouen.

CHALONS-SUR-MARNE.—March 1st. Tenders are invited for the supply of an electric pump for the local waterworks. Particulars at the Mairie of Châlons-sur-Marne, France.

Harwich.—January 13th. Four motor-driven centrifugal pumps, two motor-driven sewage rakes and screens, with switchgear, and about 400 yd. of 15-in. cast-iron rising main, for the Corporation. See "Official Notices" December 20th.

Hebden Bridge.—December 31st. One 240-KW. Diesel engine and dynamo, for the U.D.C. See "Official Notices" December 13th.

Ilford.—January 11th. Refuse destructor for the U.D.C. Mr. H. Shaw, engineer, Town Hall; (returnable deposit of £5 5s.).

Italy.—The municipal authorities of Rome are about to invite tenders for the supply of the material required for the new electric tramway between the Piazza Independenza and the Porta Traionfale; the contract includes 600 tons of tramway rails, Mannesmann poles, the overhead conductors, trailing cars, &c.

London.—FULHAM.—January 9th. Steam dynamo, switchboard and connections for the Workhouse, Fulham Palace Road, W., for the Guardians. See "Official Notices" December 6th.

New Zealand.—January 6th. Switchboards, for the Auckland Harbour Board. See "Official Notices" November 15th.

Nottingham.—January 4th. The Corporation Tramways Department is inviting tenders for the supply of (*a*) 350 tons, steel tramway rails Bs B4, 150 tons, steel tramway rails Bs B4 (Sandberg), and (*b*) 5 tons, mild steel tie bars. Specifications and forms of tender (£1 1s. each returnable) from Mr. A. Brown, engineer, Guildhall, Nottingham.

Spain.—February 10th. The municipal authorities of Badajoz are inviting tenders for the concession for the public electric lighting of the town during a period of 20 years.

Tenders have just been invited by the municipal authorities of of Cancarlos del Valle (province or Ciudad Real) for the concession for the electric lighting of the town during a period of 5 years.

Sweden.—December 31st. An electrically-driven trestle crane of 50 tons, 17 metres gauge, for Alfkarleby power station. B. of T. C.I. Department in London.

Uruguay.—March 29th. Five electric gantry cranes for Customs warehouses at Monte Video. B. of T. C.I. Department in London.

CLOSED.

Ashton-under-Lyne.—The T.C. has accepted the tender of Messrs. Robert Dempster & Sons, Ltd., for additional plant for the electricity works.

Australia.—MELBOURNE.—A tender has been accepted by the City Council for the supply of 20,800 yd. of lead-covered cables for the electric supply department. Two tenders were received—one from the Western Electric Co. (Sydney), at £5,433, and the other from Siemens Bros., at £3,866. The Electric Supply Committee recommended the acceptance of the lower tender, there being such a significant difference in the amounts.—*Tenders* (*Mining and Engineering Review*).

The same contemporary says that contracts have been secured by the India-Rubber, Gutta-Percha and Telegraph Works Co., for the electric light installations at the towns of Horsham (Vic.) and Temora (N.S.W.). In the case of the last-named town, seven months have been allowed for the completion of the work, the contract value being £6,188. Mr. J. E. Donoghue is the consulting engineer.

Barnsley.—The T.C. has accepted the tender of Messrs. S. Rushforth & Son for electric wiring work at the new waterworks and workshops, at £35.

Buenos Ayres.—The *Review of the River Plate* states that the Government has accepted the tender of Messrs. A. Scapusio and Co. for the electric light installations in the new Customs warehouses in the port of Buenos Ayres. The cost is $106,955 paper.

Finchley.—The U.D.C. has accepted the tender of Engineering and Arc Lamps, Ltd., at £314, for arc lighting at North and East Finchley. It is is proposed to use 30 flame arc lamps.

Germany.—The German Daimler Motor Co., of Marienfelde, Berlin, has just secured a contract from the Hamburg Fire Brigade authorities for six petrol-electric motor fire engine chassis.

An order has been placed with Messrs. Brown, Boverie & Co., of Mannheim, for a 40,000-H.P. steam turbine unit for the Communal Electricitätswerk A.G., at Hagen in Westfalia. This, it is claimed, will be the largest steam turbine hitherto built in Europe.—*Elektrische Kraftbetriebe und Bahnen.*

Hull.—The B. of G. has accepted the tender of Messrs. W. F. Flint & Co., of Springbank, Hull, for electrical work.

Manchester.—Messrs. Chamberlain & Hookham, Ltd., have received an order from the tramways department for 150 car meters. This is the third repeat order.

Norwich.—The T.C. has accepted the tender of Messrs. Lucy & Co., Ltd., for brackets, fuses, switch boxes, hoods, reflectors, &c., for public lighting at scheduled prices.

The Council has also accepted the tender of Messrs. R. Coller and Sons, Ltd., for 100 tons monthly of Griff peas coal for the electricity works from April, 1913, to December, 1913, at 17s. per ton.

Rawtenstall.—The T.C. has accepted the tender o Messrs. G. & J. Weir, Ltd., for a steam boiler feed pump for the electricity works.

South Africa.—The Rand Water Board received 29 tenders for an electrically-driven centrifugal pump, and the lowest was that of the British General Electric Co., at £720, for a Sulzer two-stage pump, driven by a British G.E. 260-B.H.P. two-phase motor. The time for delivery, &c., is 5½ months. According to the *South African Mining Journal*, a tender of Orenstein Arthur Koppel, at £784, had previously been accepted, for a D.C. motor, owing to a misunderstanding with the Johannesburg municipality as to the kind of current available.

Southend-on-Sea.—The following tenders have been accepted by the T.C.:—

North-Eastern Steel Co., Ltd.—Rails, fish plates, &c., for tramway extensions to Southchurch, £1,256.
E. Green & Sons, Ltd.—Economiser and air heater, £915.
Worthington Pump Co., Ltd.—Five centrifugal pumps, three steam engines and electric motor, £1,071.
Expanded Metal Co., Ltd.—Expanded metal, £35.
British Thomson-Houston Co., Ltd.—Switchboard for new steam generator, £96.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday evening, January 3rd. Paper "Some Notes on the Practical Operation of Electrical Machinery for Power Purposes," by Mr. C. E. Catterson.

Association of Engineers-in-Charge.—Saturday, January 4th. At St. Bride's Institute, E.C. Social. Dance.

Railway Train Lighting.—In his report on the fatal accident at Ditton Junction on September 17th, the B. of T. Inspector, Lieut.-Col. Yorke, referring to the burning of a number of the coaches, points out the danger of gas in railway carriages, and says that the companies would be wise to recognise the fact that electricity is safer and better.

NOTES.

The Sheffield Corporation Bill.—In the Electrical Review of August 9th we reported the proceedings before the Select Committee of the House of Lords on the Sheffield Corporation Bill, the contentious part of which was Clause 90, providing that the Corporation might "sell, let for hire, and fix, repair and remove, but not manufacture, lamps, motors, electric fuses, switches, lampholders and other electrical fittings for lighting, motive power, and other purposes." This proposal was opposed by a body of electrical engineers and contractors who were ratepayers, and as a result the Committee substituted the usual model clause, which only allows the local authority to sell electrical fittings through a contractor.

The matter came before the House of Commons on December 16th and 17th, when Mr. Pointer proposed a motion disagreeing with the amendment made by the House of Lords, and this was carried, and ordered to be communicated to the House of Lords.

Fatalities.—Johannesburg, Transvaal.—Our Cape Town correspondent writes:—"A serious accident occurred in the distribution chamber of the Victoria Falls Power Co., on Bantjes Deep on November 29th, as a result of which two men have lost their lives and two others were seriously injured. It appears that the transformer at the distribution chamber had been opened up, and four men of the maintenance department started emptying the oil out preparatory to taking it apart. About a quarter of an hour after they had started the work an explosion was heard, and when the attendant at the station went round to see what had happened, he found all four men enveloped in flames. The necessary aid was at once forthcoming, and the flames were put out. One of the men, however, died practically immediately, while the other three were taken to the Johannesburg Hospital in a very serious condition. The name of the man who was killed is W. F. Pullen. He was a young man and unmarried. Another man named McCann died in hospital the following day. A tragic scene occurred at the funeral of McCann. Over 70 people were gathered about the grave, when a flash of lightning struck half of them to the ground. One man, Michael Connell, an employé of the Victoria Falls Power Co., was found to be past human aid, and many others were very seriously injured and taken to hospital."

Chester.—The Chester Coroner (Mr. E. Brassey) on Saturday held an inquest on the body of Albert Alcock (29), crane driver, who met with a fatal accident while following his employment at Messrs. Summers's Ironworks, Shotton, on Thursday, last week.

John Williams, scrapman, said that he was removing scrap from the electric crane on Thursday, when he saw the deceased fall from the crane to the ground. He went to him and found him unconscious. He died in the infirmary.

Mr. Thos. Davis, consulting engineer, of Liverpool and London, said investigations showed that one of the fuses had slipped out of contact, which caused the current to fail. The deceased probably thought there was something wrong with the crane switch, and when he opened the box his body must have come into contact with the current. The shock would cause momentary paralysis, and deceased would be unable to hold on to the crane. Witness was of opinion that where practicable, steps should be taken to prevent crane drivers from meddling with the switches. He also recommended the provision of a rope ladder, so that the driver could descend at any time.

Mr. Kenneth Younghusband, the chief electrical engineer at the works, said the suggestion of a rope ladder was a feasible one.

The jury returned a verdict of "Accidental Death," and recommended the provision of a rope ladder for the crane.

Strikes.—Bradford.—Our correspondent says that the strike of electricians in Bradford is settling itself by natural failure. "To so large an extent have the strikers been replaced, that they now see that there is no prospect of their success, and are dribbling back and asking for some job where they can be out of sight, if possible, of those still left out. Their organiser has moved on to Glasgow, it is understood, with the intention of stirring things up in that city."

Edinburgh.—According to a Glasgow paper, between 40 and 50 men in the employment of Messrs. D. Bruce Peebles & Co., electrical engineers, Pilton Works, Edinburgh, stopped work on 17th inst. They were employed as armature winders, and had made certain demands for increased rates of pay, which the firm did not accede to. "According to the firm the wages range from £2 10s. to £4 per week, and whether on piecework or not the men are guaranteed certain weekly wages."

Calendars Going Astray.—"Colliery Electrician" writes to point out that many electrical manufacturers' calendars, &c., sent to collieries fall into the hands of the clerical staff, and never reach the technical men for whom they are intended, and who would profit by the useful information often contained in them. It would be better if they were addressed to the electrician by name if possible, or at any rate to the manager or electrician, enclosing an unstamped postcard for acknowledgment.

Stocktaking.—Messrs. Siemens Bros. Dynamo Works inform us that their store and showroom at 38 and 39, Upper Thames Street, E.C., will be closed for stocktaking on Monday and Tuesday, the 30th and 31st inst. The incandescent lamp and fittings department at Tyssen Street, Dalston, N.E., will, however, be open as usual for the sale of tantalum and "Wotan" lamps and fittings

Institution and Lecture Notes.—Initiation of Electrical Engineers (Newcastle Section).—The thirteenth annual dinner of the Section was held at Messrs. Tilley's rooms on Friday evening last, Mr. W. C. Mountain being in the chair. The toast of "The Lord Mayor, the Sheriff and the Corporation of Newcastle" was proposed by Mr. C. Faraday Proctor, who remarked upon the important part that local men had played in the development of electrical science, particularly Sir Joseph Swan and Sir C. A. Parsons. Turning to the achievements of the Newcastle Electric Supply Co., he mentioned that they had 14 power stations running, one having a capacity of no less than 40,000 kw.; their total generator capacity was 173,000 kw., not including that of the Cleveland and Durham Co. They had 76 rotary and 140 static sub-stations, 360 miles of h.t. mains, and 191 miles of l.t. mains. As evidence of the advantages of a cheap power supply, he mentioned that eight new industries were being started up in the district, and that these would take at least 50 million units per annum. The utilisation of waste heat was also largely a local industry, and he had been told that the Cleveland and Durham Co. obtained 90 per cent. of their power from this source. The Lord Mayor, in reply, said that Newcastle had moved with the times. They had a tramway system second to none, and in addition to a cheap bulk supply of electricity, they had what was of equal importance, viz, low rates.

Mr. Robert Nelson (H.M. Electrical Inspector of Mines) proposed "The Institution of Electrical Engineers." He said that Newcastle was already famous in the worlds of hydraulic, military and electrical engineering, and it had recently acquired fresh fame as the birthplace of a new beverage of singular potency. They were fortunate in their President, who had achieved what he believed to be the highest honour in the scientific world, namely, the Fellowship of the Royal Society.

Mr. W. Duddell, in reply, said that it had been decided to institute a Research Committee to co-ordinate results and also to institute research. There was a vast amount of material regarding which further information was required, and manufacturers were ready to help in regard to such raw materials as steel, india-rubber, insulating varnish, mica, &c. The question of nomenclature had also been engaging the attention of the Institution, as it was of importance that they should come to an understanding with their Continental and American friends regarding the terms to be used in connection with electrical engineering.

Mr. C. S. Vesey-Brown proposed "The Armstrong College, Learned Societies, the Newcastle Chamber of Commerce, and our Guests." Dr. Neil Maclay, replying on behalf of the medical profession, said that medical men owed a debt of gratitude to the electrical men for giving them many new means of diagnosis and treatment. Mr. Herbert Shaw (Secretary, Newcastle and Gateshead Chambers of Commerce) replied on behalf of these bodies, and said there was a fortune awaiting anyone who could devise some electrical means of recording telephone calls which would be thoroughly reliable and automatic.

In proposing "The Newcastle Local Section of the Institution of Electrical Engineers," Mr. W. Judd said that the Section, which started in 1899 with 150 members, had increased to 340 in 1912, with over 120 students. Mr. W. C. Mountain, in reply, said that 30 years ago he was asked by Mr. Cookson, of the North Seaton Colliery, whether he could pump water from a point ¾ mile in-bye, and considerable surprise was created when he undertook to do so, and to use a voltage of 350 d.c. He was pleased to say that the pump was still in existence, and he believed that it was working very well at the present time. He hoped to see the membership of their Section brought up to 500 before his term of office expired.

The speeches were interspersed with songs by Messrs. Belbin, Richardson, Scope and Willcox, the programme being arranged by Mr. J. R. Andrews. Votes of thanks to these gentlemen and to Mr. Clothier, who had organised the dinner, terminated the proceedings.

Association of Mining Electrical Engineers.—The monthly meeting of the members of the Yorkshire branch was held at Leeds on Saturday, when a paper by Mr. S. A. Simon, of the West Scotland branch, was read on the subject of "Speed Control of Three-Phase Motors."

At King's College, London, there is to be a course of lectures on Fridays, commencing January 17th, by Mr. C. H. Wordingham, on "Design, Organisation and Operation of Central Electric Stations." Particulars will be found in our "Official Notice" pages to-day.

Tramway Socials.—The annual employés' entertainment in connection with the Yorkshire (West Riding) Electric Tramways Co., Ltd., took place at Lofthouse Park, near Wakefield, last week, extending over two days. In the evenings concerts and cinematograph entertainments were provided. The manager of the company, Councillor H. England, presided each evening, and a number of Wakefield and other Corporation and tramway officials were present. Some interesting speeches were made.

At the invitation of Ald. Higham, J.P., chairman of Accrington Tramways Committee, the electric tramway employés were entertained on December 19th. Ald. Higham and members of the Tramways Committee were present, along with Mr. H. Pilling, tramways manager, and 95 tramway employés. Ald. Higham expressed regret that there was discontent among the men. It was the wish of the Committee to make their conditions as satisfactory as they were on any other tramway system in the country, and he invited those with any grievances to put their case before them. It would receive attention.

Inquiry.—A correspondent asks for the names of makers of electric water fountains; also for the makers of diaphragms for telephone receivers

Appointments Vacant.—Junior assistant to the Superintendent of Telegraphs, for the Telegraph Department of Ceylon (£300); engineer-in-charge, for the Borough Electrical Engineer's Department, Stoke-on-Trent (£130); shift engineer for the Neath R.D.C. (25s.). See our advertisement pages in this issue.

Educational Notes.—The Annual Conversazione of the ROYAL COLLEGE OF SCIENCE AND ROYAL SCHOOL OF MINES was held on Wednesday last week. The programme included a lecture by Mr. E. A. Wraight on "Aluminium," and the R.S.M. Dramatic Society in "The Bishop's Candlesticks," as well as a concert by the R.C.S. Musical Society.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—On Friday last the Hastings Council appointed MR. WILLIAM TRAVIS, of Southport, assistant electrical engineer, at a commencing salary of £150. There were 120 applicants for the post. Mr. Travis was with Messrs. Dick, Kerr & Co., and has since held an appointment at Singapore.

MR. F. J. DELVES, constructional superintendent for some time past of the sales department of the West Ham Corporation electric supply undertaking, has resigned that position on his appointment as electrical engineer to the United Malaysian Rubber Co., Ltd., whose operations extend over Singapore and other islands in the Malay group. Mr. Delves is leaving England for Singapore on January 8th, and carries with him the heartiest good wishes of his colleagues at West Ham for his future welfare.

Tramway Officials.—In acknowledgment of his services as lecturer to the Huddersfield Tramway Men's Ambulance Class, DR. RAFFAN has been presented with a case of pipes by the students. The presentation was made by Mr. J. H. Tunnicliffe, who said that the good work which Dr. Raffan had done could be understood when it was stated that only one of 28 members of the class had failed to pass when examined.

General.—*Indian Industries and Power* states that MR. J. H. CARDEW, M.Sc. (McGill), was appointed as an electrical engineer, and posted to the Oudh and Rohilkhand Railway from October 1st.

At the Presbyterian Church, Muswell Hill, on Saturday last, MR. FRANCIS E. PHILLIPS, London representative of the Wardle Engineering Co. and the St. Helens Cable Co., was married to Miss Janet Drysdale, daughter of Rev. Wm. and Mrs. Ferguson.

A financial paper states that MR. T. FRAME THOMSON has accepted a seat on the board of the La Plata Electric Tramways Co.

MR. A. H. STANLEY has resigned the position of managing director of the London United Tramways, Ltd., but will retain his seat on the board. MR. JAMES DEVONSHIRE, who has been elected a director, has been appointed to succeed Mr. Stanley as managing director. Mr. W. G. Verdon Smith, secretary, has also resigned, and MR. A. L. BARBER has been appointed as his successor.

ALDERMAN H. W. PEAL, J.P., has been re-elected chairman of the Ealing Borough Electricity Committee.

MISS J. ARMINSON MACINTYRE, over 10 years manager of the publicity department of the C. W. Hunt Co., West New Brighton, New York, is resigning that position early in the New Year, and will travel for a time. Communications will find her—care of National Arts Club, New York City.

MESSRS. DODD & DODD, civil and consulting engineers, of 37, Waterloo Street, Birmingham, have removed to more spacious offices at County Chambers, Corporation Street, Birmingham.

NEW COMPANIES REGISTERED.

Thermo-Electric Ore Reduction Corporation, Ltd. (126,015).—Registered December 18th, by Bennett, Leaver & Hayward, 41, Moorgate Street, E.C. Capital £150,000 in £1 shares. Objects: to take over the business of smelters carried on by the Electric Furnaces and Smelters, Ltd., at Luton, Beds. The signatories (with one share each) are:—H. W. Primrose, 44, Ennismore Gardens, S.W.; A. F. Maclaren, 110, Cannon Street, E.C., director, Robert Maclaren & Co., Ltd.; F. B. Henderson, Little Blakenham, Ipswich, director, National Minerals Corporation, Ltd.; A. Goodlet, 6, Broad Street Place, E.C., chairman-secretary; E. Hayward, 41, Moorgate Street, E.C., solicitor; W. B. Ballantine, 15, Devereux Court, Temple, E.C., metallurgist; D. C. Lee, 4, Paper Buildings, Temple, E.C., barrister. Minimum cash subscription, £7. The first directors (to be not less than two or more than seven) are H. W. Primrose, A. F. Maclaren and F. B. Henderson; qualification, £300; remuneration, £200 each per annum (chairman, £250). Registered office, 6, Broad Street Place, E.C.

Mid-Sussex Electric Light and Power Co., Ltd. (125,936).—This company was registered on December 16th, with a capital of £15,000 in £1 shares, to carry on the business indicated by the title. The subscribers are:—T. Caffyn, Haywards Heath, gentleman, 25 shares; C. G. M. Dawson, High Combe, Balcombe, gentleman, 25 shares; J. Finch, Queen's Road, Haywards Heath, builder, 25 shares; T. White, Franklynn Road, Haywards Heath, retired builder, 25 shares; E. Prior, Church Road, Burgess Hill, electrical engineer, 25 shares; H. P. Summer, Leyntonville, Haywards Heath, assistant overseer, 10 shares; S. Eaton, Haywards Road, Haywards Heath, clerk, 1 share. Minimum cash subscription, 5,000 shares. The number of directors is not to be less than three or more than five; the first are T. Caffyn, C. G. M. Dawson, J. Finch, T. White and E. Prior: qualification, £25. Registered office, office of E. J. Waugh, Bottro Road, Haywards Heath; solicitor, E. J. Waugh, Haywards Heath.

Electrolite, Ltd. (125,924).—This company was registered on December 14th, with a capital of £1,000 in £1 shares, to carry on the business of gas and electrical engineers, manufacturers of and dealers in gas mantles and burners, gas and electrical fittings and electric lamps, ironmongery, & The subscribers (with one share each) are:—F. Durrant, 34 and 36, Gresham Street, E.C., contractor; A. Wright, 34 and 36, Gresham Street, E.C accountant. Private company. The number of directors is not to be less tha two or more than five; the first are F. Durrant and A. Wright: qualification £25; remuneration as fixed by the company. Registered by A. D. Leir 11, Ironmonger Lane, E.C.

Craig & Paton, Ltd. (3,928).—This company was registered in Dublin on December 11th, with a capital of £10,000 in £1 shares, to acquire the business of laundry and electrical engineers and contractors, &c., carried on as "Craig & Paton." The subscribers (with one share each) are:—G. R. Craig, 11, Fisherwick Place, Belfast, merchant; G. Paton, 11, Fisherwick Place, Belfast, merchant; G. A. Shipp, Rosetta Avenue, Belfast, merchant; E. Larrsay, 59, Royal Avenue, Belfast, solicitor. Private company. The first directors are G. R. Craig, C. Paton and G. A. Shipp; qualification, 100 shares. Registered office, 11, Fisherwick Place, Belfast.

Kettlewell Electricity Supply Co., Ltd. (125,980).—This company was registered on December 17th with a capital of £625 in £1 shares, to carry on the business indicated by the title. The subscribers with one share are:—O. Robinson, Kettlewell, Yorks., worsted spinner; W. L. Carradice, Kettlewell, schoolmaster; J. H. Coutes, Kettlewell, farmer; W. P. Inman Kettlewell, postmaster; J. Ram, Kettlewell, joiner; C. H. Walsh, Kettlewell, manufacturer. Private company. Table "A" mainly applies. Solicitor C. P. Charlesworth, Bank Buildings, Skipton, Yorks. Registered by Waterlow Bros. & Layton, Ltd., Birchin Lane, E.C.

Schinz & Co., Ltd. (125,931).—This company was registered on December 14th, with a capital of £1,000 in £1 shares, to construct, equip and work public works, including railways, tramways, gas and electric light, &c. The subscribers (with one share each) are:—E. R. Calthrop, M.I.C.E., M.I.Mech.E., Eldon Street House, E.C.; J. B. Earle, M.I.C.E., Eldon Street House, E.C.; J. R. Williams, 17, Gracechurch Street, E.C., export merchant; P. Schinz, 3, Bloomsbury Place, W.C., gentleman. Private company. P. Schinz is the first director. Registered by J. J. Edwards & Co., 28, Sackville Street, W.

CITY NOTES.

Melbourne Electric Supply Co., Ltd.

THE thirteenth annual general meeting was held on Monday at the Office, Finsbury Pavement House, E.C., Mr. J. B. Braithwaite presiding.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW, last week), said he had again to congratulate them upon the remarkable progress which the undertaking had made during the year, which was reflected in every branch of the business. They would find very great changes in the balance-sheet. The capital account had been considerably increased during the year. They had issued the remaining £50,000 of their 7 per cent. cumulative preference shares, which now stood at the full amount of £150,000 instead of £100,000 last year. They had also issued the balance of the consolidated ordinary stock, viz., £125,830, raising that to £300,000, and in addition they had sold their Adelaide shares which appeared in the last balance-sheet at £82,375. Those three items together made an addition to the capital of £258,205. In addition they realised by the sale of the Adelaide shares a premium of £30,000, so that altogether they had provided themselves with £288,205 additional capital. The effect of that had been that they had been enabled to meet the expenditure at Melbourne and Geelong amounting to £11,965 for Melbourne, and £14,386 for Geelong; to pay off the bank loan, and they had £55,000 cash on loan against security and a sum of £23,241 at the bankers or in hand. The arrangements which they were able to make for the issue of the additional capital were of a very satisfactory kind. They had gentlemen who believed in the future of the company, who approached them early in the present year, and who offered to purchase the entire amount of their holding in the Adelaide Co. on terms which gave the company a profit of £30,000. At the same time they asked the directors to give them an option for a period of a certain number of months to take the unissued balance of the ordinary stock at par. At that time the shares were quoted on the Stock Exchange at from 83 to 88, and they therefore felt they would be doing a good stroke of business if, by the one transaction, they sold their Adelaide shares at £30,000 profit, and, at the same time, got an option to take the unissued ordinary capital at par. The efforts of the gentlemen in question to introduce the stock into the Colonies and make it better known had been successful, with the result that they exercised their option and they had received the whole of the cash. Turning to the profit and loss account, there were considerable changes there, owing to their having parted with their Adelaide shares. Last year they received from those shares £9,715, a source of profit which was, of course, not open to them this year. On the other hand, Melbourne had yielded them an additional profit of £17,055 and Geelong £2,050, whilst the little tramway system which they opened early this year had yielded £738, so that they had £19,843 extra revenue. Against that they had to put the loss of the £9,715 from the Adelaide shares, leaving them with a net improvement of £10,128. Turning to the accounts of the two stations at Melbourne, the gross increase in the revenue was £20,019, the figures being £84,738 this year, against £61,719; whilst, on the other side, the generating expenses had only gone up from £15,237 to £17,470, from which they would see that of the £20,019 gross increase they retained 85 per cent. of it as net—that was, £17,055—which spoke extremely well for the ability of their staff and for the excellence of the management. So well had the staff worked that the generation costs had actually been reduced 20·4 per cent., and the coal consumption alone had been reduced

18 per cent. That, of course, was due to the new turbines and other generating plant which they had sent out, and which was more economical in its operation. At Geelong they saw the same story repeated, although on a smaller scale. The gross increase in the revenue was £3,057, and they had retained £2,045 as net—that was, 66 per cent. The tramways account was only in its inception. The line was only opened for traffic for five months up to August, and the receipts amounted to £5,471, showing a small profit of £738. The total population of the district served by the tramway was 26,000; the total length of the track at present was four miles. The total number of passengers carried for the five months was 422,000, and the passengers carried by the motor-'buses which they had to supplement the tramways was 26,000, so it would be seen that every one of the population had ridden on the tramways about 20 times. They were now constructing an additional 1¼ miles for the South Geelong section, and no doubt when that was opened it would immediately increase their earnings from the tramways. With regard to the general position in Melbourne, he could not do better than read them an extract from the report of Mr. F. W. Clements, their local managing director and chief engineer. Writing under date November 6th last, that gentleman said:—

"The financial year under review should prove a red-letter year with us, for not only has the general progress during that period been phenomenal, but it is the first time that we shall have been in a position to pay a reasonable dividend on the whole of our invested capital. The progress made by the company has been manifested not only by the enormous number of consumers connected during the year, but also by the very large increased output in units and the increased maximum load. At no previous period of our history have we ever made anything like the advance in any of these three items in one year. The year is, therefore, a record one from nearly all points of view. The causes conducing to the great advances made appear to be several, the principal one of which is probably the long run of good seasons from the agricultural point of view which has taken place since the great drought in 1903 and 1904. This has been responsible for making the community generally much more prosperous, and the result has been that through the gravitation of the more well-to-do squatting and farming population to the city, an acceleration in the natural increase in population, a more active policy of immigration adopted by the Government, and the fact that large numbers of people have gradually got into the position of being able to build their own houses, enormous areas of suburban Melbourne have been built over, and the bulk of the new houses have taken on electric supply. This, however, is only one cause, and it is quite certain that unless the metallic-filament lamp had come to the fore, even under the conditions of general prosperity obtaining, people would not have been so ready to avail themselves of an electric supply. A third cause operating in the direction of the great increase experienced has undoubtedly been our policy of pushing forward into the residential districts with our mains in advance of the wave of houses rolling out into the country. It is a well-known thing amongst electric supply people that once an area newly built over has been missed, it may take years to get the houses to come on to the mains, whereas, if the houses, as they are being built, find a supply available, the chances of securing the bulk of them are enormously increased. So much so has this been the case with us in Melbourne, and to a smaller extent in Geelong, that we can say that there is hardly a house in any new area which does not come on to the mains. Best of all, architects, builders and small speculative builders, all now specify electric lighting as a matter of course, and newspaper advertisements announce the presence of an electric supply in a house as an added advantage."

Continuing, the chairman said that during the year they had pushed out into three new districts, and their mains now pretty well covered the whole of the suburbs of Melbourne. The following figures were, he thought, very remarkable. The area of their Melbourne district was now 43 sq. miles, showing an increase of 24 per cent. since last year. The population of the city was 317,000, an increase of 2 per cent. The miles of street in which their supplies were available were 304, an increase of 47 per cent. The capacity of their plant was now 5,600 KW., an increase of 48 per cent., and they had another 3,500 KW. alternator, which would shortly be shipped, which would bring their plant up to over 9,000 KW. The number of new consumers they had connected during the year was 3,620—slightly over 300 a month—and an increase of 75 per cent. over last year. The total number of consumers on their mains at the end of the year were 8,696, showing an increase of 71 per cent. The units sold for the year were 7,082,000. At Geelong the story was the same, although on a smaller scale. There were now 33 miles of street in which their supply was available, an increase of 19 per cent. They had connected 215 new consumers during the year, an increase of 36 per cent., and they had now 1,099 consumers at Geelong, with its population of 27,800—an increase of 24 per cent. As to the future, as far as their information at present went the prospects for the current year were fully as satisfactory as those for the past. Down to the end of November, the first three months of the new financial year, their gross profit in Australia was £15,700 this year, against £6,076 last year. The total number of new consumers connected was 1,400, as compared with 690, and the number of new consumers awaiting connection was 720, as compared with 428 last year. At the moment the outlook for the present year was extremely good, although it would be foolish to expect that such a phenomenal rate of increase could possibly continue indefinitely. The general resolution for the electrification of the Melbourne railways had been approved by the Victorian Government, and there was no doubt that the electrification would take place within the next three or four years. If the Government could generate current cheaper than they could—which he very much doubted—and supply it to them in bulk, it would be to their advantage to take it from that source. The Government claimed that they were only going to supply the railways and that they were not going to enter into the field of distribution or compete with them in any way, and it would be for the directors to see that their promises in that respect were kept.

Mr. David Finlayson seconded the motion, and the report was adopted.

The Chairman then proposed a resolution increasing the number of directors from five to six. He explained that the reason for the change was that he and his colleagues considered it would be to the advantage of the company to have a gentleman connected with Australia on the directorate, and should the resolution be carried and confirmed, they intended to nominate Mr. Benjamin Brookman as the sixth director specially to represent the interests of the Australian shareholders.

Mr. Nicholls seconded the resolution, and it was carried.

The Chairman said that the next resolution, as follows, was intended to carry out what was suggested at the last meeting, but which he did not consider justified in accepting at the time: "That the remuneration of the directors for the year ended August 31st, 1912, be £1,500 instead of £1,000 as provided in Article 87, and that as from September 1st, 1912, the remuneration of the directors be upon the following basis, viz.: 'So long as the issued capital of the company (including debentures or debenture stock) does not exceed £750,000 the remuneration of the directors shall be £1,500 per annum, and that if and when the issued capital of the company (including debentures or debenture stock) exceeds £750,000, then the remuneration of the directors shall be increased at the rate of £125 per annum for each £100,000, or part thereof, of further capital (including debentures or debenture stock) issued by the company.'"

Mr. B. Brookman said that as he was the shareholder who suggested at the last meeting that they should increase the remuneration of the directors, he had much pleasure in proposing the resolution which the chairman had read.

Mr. Hawes seconded the resolution, and it was carried unanimously.

The auditors having been reappointed, the proceedings terminated with a vote of thanks to the officers and staff of the company in Australia and in London.

Johnson Secret Wireless Telegraph and Telephone Testing Syndicate, Ltd.

The *Financial News*, of December 20th, contains an article relating to this company in which it reprints the report to November 30th last, and says that the annual meeting was held in private on December 19th, at 40, King Street, Cheapside, E.C.—The report states that:—"During the past year great progress has been made, both from a financial and from a technical point of view. The Universal Cheap Cables, Ltd., which was formed for the purpose of acquiring the undertaking of this syndicate, has now 10,000 working capital shares issued, and arrangements are contemplated for the disposal of the balance of such shares. It is the intention of that company to get a special settlement granted by the London Stock Exchange in its working capital shares, and in due course in its vendor shares.

"An agreement has been entered into for the transfer of the Johnson-Varley Patents and Instruments to the Universal Cheap Cables, Ltd., and the actual transfer will take place without delay. An agreement has been entered into, for the benefit of all concerned, to pool the shares to be allotted to this syndicate in respect of the purchase price. Arrangements are also being made for the payment of the syndicate's debts.

"The Universal Cheap Cables, Ltd., has agreed to purchase the site at Norman's Bay on which the mast erected by this syndicate stands, and arrangements are being made to fit up a practical wireless station again there. Another station is being erected in London, and it is expected that demonstrations in the Johnson-Varley untappable system will be made between Norman's Bay and London, and elsewhere.

"An exceedingly interesting report on the system has been given by Prof. Silvanus Thompson, F.R.S., and a copy of this report can be seen by shareholders at the syndicate's registered office. The Universal Cheap Cables, Ltd., have appointed Mr. F. Heron Rogers, A.M.I.M.E., consulting engineer, to represent the interests of the Johnson-Varley system before the Marconi Commission and at the War Office Secret Committee on Wireless Telegraphy."

Hobart Electric Tramway Co., Ltd.—An interim dividend of 9d. per share, as compared with 6d. last year, is announced.

J. G. White & Co., Ltd.—The directors have declared an interim dividend at the rate of 12 per cent. per annum on the ordinary shares for the half-year ended August 31st.

Hart Accumulator Co., Ltd.—The directors have declared the usual dividend for the year, viz., 10 per cent., and 2½ per cent. bonus, free of income-tax.

Central London Railway Co.

DR. H. F. PARSHALL (chairman) presided on Thursday, December 19th, at the Holborn Restaurant, over an extraordinary meeting of the shareholders of the above company held for the purpose of explaining the proposed arrangement with the Underground Company.

The CHAIRMAN having explained that the meeting was held as a matter of courtesy, and that matters dealing with the domestic affairs of the company could not be raised until the ordinary meeting in February, said that in any dealing with the shares the fundamental consideration was, of course, the security of the guarantee. Their railway was opened in 1900, and was the first of the railways opened from east to west in London with a modern electric service. The takings of the line during the first few years were such as to warrant the company in paying 4 per cent., but later the Metropolitan District and the Metropolitan Railways were electrified, and the Great Northern, Brompton and Piccadilly Railway constructed, so that they were in close competition with railways which gave substantially the same facilities over different routes. As a result the dividend fell to 3 per cent., and had been since maintained at that rate under increasing difficulties in consequence of the 'bus competition over the route. In the last year they paid 4 per cent.; 155 'buses passed a certain point on their route in a given period, whereas to-day 354 'buses passed the same point in the same period. The earnings of the present half-year would amount approximately to £131,000, as against £186,000 in the past half-year, which was to say that there had been a shrinkage on the half-year of £55,000, which had arisen purely on account of the competition never anticipated when the railway was built. Since he had been chairman there had been a large reduction in the working expenses, and they had found new sources of revenue in the carriage of parcels, advertising, &c., so that taking advantage of all the means before them, the 3 per cent. dividend had been maintained. Last August they were able to open the Liverpool Street extension. Owing to the efforts of their engineers and contractors, it was opened earlier than anticipated, and they got five months' working into their balance-sheet of this year. Liverpool Street would contribute from £40,000 to £50,000 in their takings, but the unsatisfactory element was that from £20,000 to £30,000 had been absorbed by increasing 'bus competition. However, that extension had enabled them to maintain the 3 per cent. The other prospective advantage was the Ealing extension, which would take from 1½ to two years to complete, and as Ealing was not as populous a neighbourhood as the district they drew on from the Great Eastern, it might readily happen that the 'bus competition would anticipate any profit they might obtain from that extension. Consequently, it would appear that the best the shareholders had to look forward to was the 3 per cent. dividend, after taking advantage of every possible resource available to the company. Under the proposed arrangement, the Underground Co. would guarantee a dividend of 4 per cent., and in case the Underground Co. had a surplus, after having earned 4 per cent. on the average for three successful years, the ordinary shareholders of the Central London Co. would be entitled to 40 per cent. of that surplus. It had been suggested that the Underground Co. might never be likely to declare a surplus, but if they did not pay the shareholders the 40 per cent., they could not get the 60 per cent. As regarded the financial position of the Underground Co. to make that guarantee, the figures in the last balance-sheet showed that it was secured more than 11 times over. The question of what would happen if the Underground Co. failed in their obligations had been most carefully considered, and the trust deed provided that in such an event the property should be restored to the shareholders in as good a state as it was taken. The Underground Co. in the trust deed undertook (1) to exercise its voting power so that there should always be on the board of the Central London Railway Co. two directors to represent the interests of the guaranteed stockholders. (2) That the railway should be properly maintained and operated, so that in the event of the determination of the trust the railway and rolling stock should be found to be in proper and efficient condition. (3) Not to use the present reserve fund of the Central London Railway Co. for the payment of dividends. (4) That the provisions of any contract entered into by the Central London Railway Co., which would alter the position or character of the undertaking, or which would be calculated to prejudice the guaranteed stockholders in the event of their exchanging their guaranteed stock for railway stock, should be so expressed as to come to an end, if and when the trust was determined, unless such provisions should have been approved in writing by the two directors representing the guaranteed stockholders or by an extraordinary resolution of a meeting of the guaranteed stockholders. (5) That any further capital which was issued by the Central London Railway Co. should be issued on such terms as would secure the greatest advantage to the undertaking of that company. The debenture-holders and preference stockholders were not affected by the scheme. The ordinary stock consisted of the proportions of 56⅜ undivided ordinary, 21¾ preferred ordinary, 21¾ preferred ordinary and 21¾ deferred ordinary, and they were treated in the same way, as it was necessary to have the preferred shareholders' assent if the requisite majority of 75 per cent. of the stockholders was to be obtained. The preferred stockholders might, of course, say that they were receiving ¾ per cent., and there was no reason for going to the trouble of handing over their stock to anybody else; but the answer was that it would be to the interest of the Underground Co. to make the company as remunerative as possible, and the stockholders would share in any surplus. The whole expenses of the arrangement would be borne by the Underground Railway Co.

MR. WALFORD said he had been connected with the company from the first, and had taken great interest in it in good times and bad. He congratulated the board on the terms obtained from the Underground Co. They had been told what the Liverpool Street extension had done for them, and when the Ealing extension was opened he thought the probability was that the takings would be as great as the Liverpool Street extension. There was also the proposal to join up at Gunnersbury with the South-Western Railway, and, taken altogether, he considered their contingent rights were very valuable. They all knew what the general manager, Mr. Partridge, had done in reducing expenses, and what Mr. Moss, the secretary, had done, and he trusted that they would be well looked after.

MR. STURDY asked on what principle the board gave the deferred shareholders the same as the preferred. His opinion was that this was jobbery.

MR. FITCH asked if the money now set aside for depreciation was to be used for dividends.

The CHAIRMAN said the funds could only be used on the railway and not for dividends. It would be seen that they were amply guaranteed to have their railway back in good condition.

MR. FITCH thought the arrangement was a good one, and that they would be able to get their electric supply at a cheaper rate from the generating station of the Underground Railway.

MR. T. H. HAWKINS asked if the company kept their reserve fund.

The CHAIRMAN said it would be carried forward as Central London property, and would be available for the purposes of the railway.

COL. BENTLEY asked how the two directors of the company were to be appointed to the new board, and how future elections were to be made.

MR. SEFTON JONES, as a preferred shareholder, supported the proposal.

MR. ANDERSON thought they were bound to come into the scheme of controlling the traffic of London.

MR. BEARD asked why the deferred shareholders, receiving 2 per cent., were to be put in the same position as the preferred holders getting 4 per cent. If they ever had to receive their railway back, would they get their reserve fund back also? He also wished to know what compensation was being given to the directors.

The CHAIRMAN, in reply, said he had already explained that to get the necessary majority it was necessary that the preferred shareholders should have some slight incentive to come in, and under this arrangement they got a better guarantee and also the right to share in the 40 per cent. It had to be remembered that the offer came from the Underground Co. As to the directors, two of the directors from the present board might be elected, or any two as representing the interests of the company. The compensation to directors and staff fell on the Underground Railway Co. Suitable provision was made for the staff, and the staff were satisfied with it.

MR. MORRIS (solicitor) said two directors of the company would remain on the board and the others would retire, and be replaced by nominees of the Underground Co. In the event of either of the two retiring from the board, a fresh director would be elected by the shareholders of the Central London Co. Everything else would go on as now.

Several other matters with respect to the quotation of the shares in the future having been answered, the meeting ended with a vote of thanks to the chairman.

Metropolitan Railway Co.—It is stated in the daily papers that the directors of this company have decided to insert in their Bill for next session power to raise £1,200,000 additional capital, exclusive of the capital that will be required to purchase the undertaking of the Great Northern and City Railway Co. Of the £1,200,000 new capital, £300,000 is proposed to be raised by the issue of debenture stock, if necessary "at a discount," and the balance of £900,000 is to be raised "on such terms and conditions at such price above or below the nominal amount, and in such manner as the directors think advantageous to the company."

Stock Exchange Notice. — Application has been made to the Committee to allow the following securities to be quoted in the Official List:—

Consolidated Diesel Engine Manufacturers, Ltd.—427,076 shares of £1 each, 15s. paid (Nos. 1 to 427,076), and 67,470 shares of £1 each, fully paid (Nos. 527,077 to 594,546).

Continental.—AUSTRIA.—The report of the Austrian Brown-Boveri Works Co., of Vienna, for the last financial year states that large orders have been secured for tramway motors from the municipal authorities of Vienna and for a number of tramway equipments for the towns of Teplitz and Mahrisch-Ostrau. The net profit for the year amounted to £13,280, out of which a dividend of 5 per cent. is being declared.

Direct West India Cable Co., Ltd.—The directors, says the *Financier*, have declared an interim dividend at the rate of 6 per cent. per annum (1s. 6d. per share) on the ordinary shares for the half-year ended December 31st.

Calcutta Electric Supply Corporation, Ltd.—The number of units delivered to consumers during the four weeks ended November 29th, 1912, amounted to 817,119, compared with 712,454 units in the corresponding four weeks of 1911.

Osram Lamp Litigation.—An injunction has been granted in the Chancery Division against David Smith & Co., on the application of the Osram Lamp Co. We shall report the matter next week.

STOCKS AND SHARES.

Saturday Afternoon.

Only the prospect of a bare larder and a cold radiator on Christmas Day compels unwilling attention to such inappropriate matters as Stock Exchange markets at this season of the year. We could fill a couple of columns or so with descriptive matter of Mr. "Salvation" Smith's journey through the Stock Exchange markets, and the various other incidentals which are inseparable to the House in Throgmorton Street at Christmas time. But it is to be doubted whether the editorial frown would not censor such purely topical subjects, and one cannot write indefinitely even upon the charming effect produced by covering the electric lights in the Stock Exchange with tissue paper of various shades.

Descending laboriously, therefore, from these considerations, it has to be noted as a feature of the electrical markets that prices are decidedly better than they were when we wrote at the beginning of the week. The Stock Exchange was relieved by the announcement on Thursday forenoon of the retention of the Bank of England Rate at 5 per cent.; while the pacific progress of the peace negotiations is another influence making for more confidence. A smart recovery in the price of Consols formed a useful adjunct to the strength of investment markets as a whole, and it looks as though the year will wind up with firmness in most of the active departments.

This applies particularly to the Home Railway market, where there is a substantial rally. At the meeting on Thursday, Central London holders gave sufficient assent to the scheme of the Underground Electric Railways Company to make the offer made by the latter company binding upon it, and Central London stocks have improved to the extent of a point apiece in the Ordinary and Deferred, and two points in the Preferred. It seems somewhat anomalous that the quotations for the three stocks should not be on all fours; but what seems more anomalous still is that the Preferred should be treated in precisely the same manner as the other two stocks. Of course, the scheme is purely optional on the part of holders, and therefore they cannot complain logically at the treatment offered them. There is, however, a good deal of feeling on the subject, and quite possibly the resentment may come to a head before the year is out.

City & South London rallied ½, and Metropolitans jumped 1¼, while Districts put on ¼. The Metropolitan Company announces that it intends to take powers for the issue of fresh capital, but this had no effect upon the buoyancy of the market. Underground Electric Railway shares have forged ahead on the successful passage of the company's offer to the City & South London and to the Central London stockholders, the shares rising ⅜ and the 6 per cent. Income bonds being 2½ up at 92½, amid vague suggestions that the latter will certainly receive their full 6 per cent. for next year, while optimists look for the redemption of the whole of this issue at par before very long.

The English Electricity Supply market is not featured by one solitary movement. It would require the pen of a professional journalist to do full justice to a market which flouts in this way the energies of the weekly paragraphist, so maybe it is better to say no more upon the subject.

The market in National Telephone stock continues to attract a good deal of what little attention is left for stocks and shares. The price was jerked down the other day to 134, whence ensued a recovery to 138½, this leaving a rise of 1 on the week. All kinds of estimates are now current as to the figure at which the stock will be ultimately paid off; and since, so far as we can tell, it is impossible to form any reliable guess as to the final figures, we will forbear quoting the various prophecies. Marconis, after being still flatter, rallied a shade; but the market is not yet by any means a good one, and even some of the Company's supporters begin to admit that other competitive systems need to be taken into account. A little activity revived in American and Canadian Marconis, the prices for both hardening up; but it is noticeable how any improvement brings in sellers. However, Americans are better at 1 1/16, and Canadians at 17s. 9d.

United River Plate Telephones and Chile Telephones both gained ⅛, while American Telephone capital stock picked up its small loss of a week ago. In the Telegraph list proper, there is practically nothing doing. Reuters shed ¼, taking the price down to 10¾.

In the Latin-Canadian group, the principal change is a fall of 4 points in Northern Light and Power bonds; but the rest of this section is steady, and improvements of a point or so have occurred in Brazilian Tractions, Shawinigan Water, Mexican Electric 5 per cent. bonds, and Sao Paulo Debenture. Kalgoorlie Electric Trams Debenture stocks are weak, especially the "B," which has dropped to a nominal quotation of 35. Underwriting letters in respect of the new issue of British Columbia Electric Debenture stock had to be lodged, at the latest, this (Saturday) morning. The underwriting commission was 2½ per cent. in cash.

The Manufacturing group maintains its steadiness. India-Rubber shares, after their recent drop, recovered ¼ to 10½. Babcock Preference are a shade easier. The rubber auction sales this week at Mincing Lane proved somewhat disappointing to the expectations of those who had been looking for an advance in prices, and the share market became very dull in consequence. Upon the completion of the sales, however, an improvement occurred in the price of the raw stuff, which was reflected in a general rally amongst the shares, and the market has regained its firmness.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	Dec. 18	2,695	+ 3	29	44,628	+ 521	14·4	..
†Ayr	„ 14	200	+ 10	30	10,887	+ 279	8	..
Bath	„ 21	1,374	— 6	51	44,550	+ 2,258	..	..
Birmingham Corp.	„ 14	22,867	+5,572	37	397,768	+118,190	57·17	..
†Blackburn	„ 11	1,120	+ 105	37⅞	44,604	+ 1,065	14·62	..
Blackpool Corp.	„ 19	878	+ 48	..	63,570	+ 5,910	11·87	..
†Blackpool-Fleetw'd	„ 14	235	+ 20	28	24,756	— 478	8	..
Bournemouth	„ 18	3,004	+ 62	37⅞	71,278	+ 2,159	21·95	..
Bradford	„ 14	10,569	+ 508	37	206,160	+ 1,017	56	..
†Brighton	„ 15	793	+ 47	37	39,256	— 941	9·5	..
Bristol	„ 20	14,178	+1,620	..	353,275	+30,155	30·5	..
Brit. Elec. Trac. Co.								
‡Airdrie	„ 3	571	+ 43	50	14,954	+ 3,528	3·65	..
Barnsley	„ 3	394	+ 31	„	9,119	— 137	..	..
Barrow	„ 3	635	+ 47	„	18,816	+ 3,392	5·37	..
Devonport	„ 3	809	+ 21	„	26,700	+ 1,761	8·85	..
Gateshead	„ 3	2,184	+ 96	„	52,431	+ 331	11·25	..
Gravesend	„ 3	403	..	„	10,563	— 96	6·5	..
Greenock	„ 3	1,443	+ 19	„	40,247	+ 3,983	7·25	..
Kidderminster	„ 3	183	+ 5	„	5,888	+ 119	..	..
Merthyr	„ 3	383	— 12	„	10,061	— 383	2·9	..
Metropolitan	„ 3	16,664	+ 341	„	437,411	— 143	22	..
Middleton	„ 3	557	— 27	„	16,566	— 353	8·5	..
Mid. Joint Com'tee	„ 3	6,643	+ 621	„	165,150	+ 9,118	..	..
Oldham—Ashton	„ 3	1,126	+ 21	„	31,434	+ 1,707	9·13	..
Peterborough	„ 3	229	+ 10	„	6,781	+ 385	5·31	..
Potteries	„ 3	4,225	+ 29	„	97,312	— 1,149	29	..
Rothesay	„ 3	80	+ 1	„	10,614	+ 500	2·75	..
Southport	„ 3	483	+ 24	„	14,875	— 179	8·17	..
S. Metropolitan	„ 3	1,456	+ 75	„	41,949	— 712	..	..
Swansea	„ 3	2,231	+ 89	„	57,596	+ 429	12·5	..
Tynemouth	„ 3	491	+ 113	„	12,001	— 814	3·75	..
Weston-s-Mare	„ 3	52	+ 27	„	6,891	— 1,298	3	..
‡Worcester	„ 3	483	+ 3	„	14,619	— 41	5·75	..
Wrexham	„ 3	204	+ 6	„	5,740	+ 623	..	..
Yorks. Wool. Dist.	„ 3	2,071	+ 64	„	54,069	+ 1,402	17	..
Miscellaneous	„ 3	437	+ 81	„	11,575	+ 293	..	..
†Burnley	„ 14	1,533	+ 199	..	..	..	12·44	·8
†Burton-on-Trent	„ 15	271	+ 10	37	10,100	— 445	6·6	..
†Bury	„ 15	1,225	+ 79	37	48,249	+ 38	22·5	..
†Cardiff	„ 14	2,519	+ 169	37	90,776	— 1,033	17·35	..
Chatham and Dist.	„ 12	1,575	+ 59	50	42,681	+ 144	14·98	..
Cork	„ 19	912	— 21	51	24,403	— 961	9·89	..
†Croydon	„ 6	1,619	— 13	36	65,154	— 625	11·6	..
Darlington	„ 14	438	+ 18	37	8,347	+ 125	4·87	..
†Darwen	„ 13	274	+ 28	37	10,367	+ 360	4·36	..
Dover	„ 14	375	..	37	9,266	— 576	4·75	..
†Dublin	„ 13	5,576	+ 316	..	138,203	— 7,630	54·25	..
†East Ham	„ 14	1,056	+ 6	37	39,774	— 889	7·87	..
†Glasgow	„ 14	19,317	+1,755	..	529,953	— 8,419	98	..
†Hastings	„ 12	684	— 10	..	..	— 2,409	19·3	..
†Hull	„ 14	3,100	+ 101	37	110,025	+ 1,573	13·5	—1
Ilkeston	„ 19	225	— 17	38	4,286	— 769	..	..
†Ipswich	„ 14	870	— 20	37	16,735	— 124	10·5	..
Kilmarnock	„ 14	306	+ 10	30	4,992	— 154	4·25	..
Lancashire United	„ 18	2,614	+ 118	51	68,532	+ 303	39	..
†Leeds	„ 14	7,752	+ 454	37	289,238	+10,277	65	7·5
†Leicester	„ 14	2,674	+ 175	50	128,044	+ 4,534	20	..
Leith	..	..	..	..	..	..	3·72	..
Liverpool	„ 14	24,565	+1,015	49⅔	598,698	+26,264	119	2
†L.C.C.	„ 11	81,973	—2,683	..	1,534,760	—77,448	142·2	4
†London United	„ 14	5,540	+ 301	..	309,707	—13,239	..	..
†Lowestoft	„ 14	177	..	10	1,882	— 13	3·5	..
†Manchester	„ 14	17,084	+ 957	37	622 813	+22,579	105	..
†Newcastle	„ 14	5.080	+ 656	..	164 354	+ 4,241	31·3	..
Newport	„ 14	1,129	+ 102	37	26,286	— 219	7·25	..
†Oldham	„ 15	1,979	+ 783	38	78,063	+ 4,696	23	..
Pontypridd	„ 16	832	+ 52	37	14,839	— 548	5·5	..
Preston	„ 4	1,497	+ 78	36	29,919	+ 1,376	10	..
Rotherham	„ 18	1,748	+ 379	37⅞	29,214	+ 3,401	18	6
†Salford	„ 16	5,022	+ 248	37	187,226	+ 4,647	41	..
†Sheffield	„ 17	7 226	+ 560	..	255,425	+11,788	40	..
†Southampton	„ 11	1 117	+ 62	36	45,926	— 140	11	..
Southend-on-Sea	„ 18	1,093	+ 171	38	30,716	+ 3,307	7	..
†South Shields	„ 14	641	+ 54	37	23,641	+ 321	10·25	..
Tyneside	„ 18	1,190	+ 339	25	12,391	— 240	11	..
Wallasey	„ 14	1,994	— 1	37	41,456	— 501	8·72	..
†Walthamstow	„ 14	664	+ 49	37	27,008	— 1,012	9	..
West Ham	„ 12	5,016	— 189	36⅓	96,172	— 3,812	16·45	1·2
Wolverhampton	..	..	..	..	..	..	13·75	..
†Jen. London Rly.	„ 14	5,795	+ 355	24	116,635	+ 4,121	6·78	·4
†City & S. Lon. Rly.	„ 15	3,204	— 134	24	70 636	— 6,092	7·26	..
Dublin-Lucan Rly.	„ 20	225	— 11	25	3,592	— 97	7	..
†G.N. and City Rly.	„ 14	1,482	— 210	24	33 94	— 1,084	8·5	..
†L'pool Overh'd Rly.	„ 15	1,595	+ 51	24	39 2 2	+ 3,225	6·6	..
Llandudno-Col. Bay	„ 13	1 13	+ 17	2	234	— 17	6·5	..
†Lond. Elec. Ry. Co.	„ 14	14,830	+ 125	24	316,205	+ 4,645	21·25	..
†Mersey Railway	„ 14	2 370	+ 82	24	51,856	+ 4,948	4·5	..
†Metropolitan Rly.	„ 15	18,4 6	+ 9	24	410,481	+ 5,279	5·71	..
†Met. District Rly.	„ 14	18.054	+ 546	24	300,881	23 524	25	..
Anglo-Argentine	„ 16	115,919	+13,857	..	2,586,217	+130,489	..	..
§Auckland	Nov.	19 174	2 580	..	97 203	+15,752	14·11	·8
Bombay (B.E.T.)	Nov 21	7 2 7	+ 659	47	142 763	+ 5,714	..	..
§Brisbane	Nov.	24,310	+2,420	11	228,421	— 551	..	..
†Calcutta	Dec. 14	4 3 6	+ 289	..	..	..	..	..
§Kalgoorlie, W.A.	Nov.	2 86!	..	..	84 604	..	30·5	..
Madras	Dec. 15	588	73	..	57,220	+ 1,873	14·7	2
§Montevideo	Nov.	9 6 3	+3 09	..	..	..	..	..
†Perth (W.A.)	Dec. 18	2 1 1	+ 322	..	98,238	12 360	29	..

* Compared with the corresponding period of 1911. † One week only.
Includes horse, steam and other receipts. § One month.

Reduction of Capital.—Application for confirmation of a reduction of capital of Miller & Sons (Ltd. and Red.) from £30,000 to £18,447, was presented to the Court on December 5th and is now pending. Reference is made to the matter in our advertisement pages to-day.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Dec. 21st.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord. ..	10	5½	5†	9⅛ — 10⅜	..	5 4 9
Do. 4½ % Pref.	10	4½	4½	8⅞ — 9⅜	..	4 12 4
Do. Second 6 % Pref. ..	10	6	6	10 — 10½	..	5 14 8
Do. 4½ % Deb. Stock	Stock	4½	4½	98 —100	..	4 10 0
Brompton & Kensington, Ord...	5	10	9†	8⅞ — 9¼	..	5 8 1
Do. 7 % Cum. Pref.	5	7	7	8¾ — 9	..	3 17 9
Central Electric Supply, 4 % Guar. Deb.	100	4	4	96 — 98	..	4 1 8
Charing Cross, West End & City	5	5	5†	4⅜ — 5⅛	..	4 17 7
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4⅝	..	4 14 9
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	4 — 4½	..	5 0 0
Do. Do. 4 % Deb... ..	100	4	4	92 — 94 xd	..	4 5 1
Chelsea, Ord.	5	5	4†	4½ — 5	..	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	98 —101	..	4 9 1
City of London, Ord.	10	8	6†	16 — 18	..	4 9 0
Do. 6 % Cum. Pref.	10	6	6	12 — 13½	..	4 9 0
Do. 5 % Deb.	Stock	5	5	118 —122	..	4 2 0
Do. 4½ % Second Deb. ..	100	4½	4½	100 —103	..	4 7 5
County of London, Ord... ..	10	6	4†	11⅛ — 12	..	5 0 0
Do. 6 % Pref.	10	6	6	11⅝ — 12⅝	..	4 19 0
Do. 4½ % Deb.	Stock	4½	4½	106 —108	..	4 3 4
Do. 4½ % Second Deb. ..	Stock	4½	4½	98 —101	..	4 8 3
Edmundson's, Ord.	£3	Nil	..	3/16 — 5/16	..	Nil
Do. 6 % Cum. Pref.	5	Nil	3	4 — 5	..	..
Do. 6% Non-Cum. Pref. ..	5	..	..	1 — 2	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	84 — 87	..	5 3 6
Folkestone	5	6	6	4⅝ — 5⅛	..	5 17 1
Do. 5 % Cum. Pref.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % First Deb.	100	4½	4½	92 — 95	..	4 14 9
Hove	5	9	8†	7⅞ — 8	..	5 12 6
Kensington & Knightsbridge, Ord	5	9	8†	7⅝ — 8⅛	..	5 10 9
Do. 4 % Deb.	Stock	4	4	92 — 95	..	4 4 3
Kent Elec. Power, 4½ % Deb. ..	Stock	4½	4½	78 — 82	..	5 9 9
London Electric, Ord.	8	2½	..	1⅛ — 2	..	3 15 0
Do. 6 % Pref.	5	6	6	4¾ — 5½	..	5 14 3
Do. 4 % First Mort. Deb. ..	Stock	4	4	88 — 91 xd	..	4 8 0
Metropolitan	5	4	4†	3⅜ — 3⅞	..	5 3 3
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4¼	..	5 0 0
Do. 4½ % First Mort. Deb. ..	Stock	4½	4½	99 —102	..	4 8 3
Do. 3½ % Mort. Deb.	Stock	3½	3½	86 — 88	..	3 19 7
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	99 —101	..	4
Newcastle-on-Tyne 5 % Pref., Non-Cum.	5	5	5	4⅜ — 4⅞	..	5 2 7
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98½ —101½	..	4 18 6
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	10 — 11	..	5 9 1
Oxford	5	7½	6†	6½ — 6⅝	..	5 9 6
St. James' and Pall Mall, Ord.	5	10	10†	9½ — 10½	..	4 17 7
Do. 7 % Pref.	5	7	7	6¾ — 7½	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	85 — 88	..	3 19 7
Smithfield Markets, Ord. ..	5	2	..	1⅜ — 1⅞	..	..
South London, Ord.	4	5	..	2⅝ — 3⅜	..	5 16 4
Do. 5 % First Mort. Deb. ..	100	5	5	98 —101	..	4 19 0
South Metropolitan, 7 % Pref...	1	7	7	1⅝ — 1⅞	..	5 9 5
Do. 4½ % First Deb. Stock ..	100	4½	4½	96 — 99	..	4 11 3
Urban, Ord.	£3	Nil	..	1/16 — 3/16	..	..
Do. 5 % Cum. Pref.	5	2	½	2⅛ — 2½	..	..
Do. 4½ % First Mort. Deb. ..	100	4½	4½	84½ — 88½	..	5 1 8
Westminster, Ord.	5	10	9†	8⅞ — 9¼	..	5 8 1
Do. 4½ % Cum. Pref.	5	4½	4½	4⅝ — 5¼	..	4 5 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

	*					
Adelaide, 6 % Pref.	5	6	6	5⅛ — 5⅝	..	5 6 8
Calcutta, Ord.	5	8½	7†	6⅝ — 7⅛	..	5 19 4
Do. 5 % Pref.	5	5	5	4 15/16 — 5 1/16	..	4 16 5
Calgary Power, 1st Mort. Bds.	100	5	5	94 — 96	..	5 4 2
Canadian Gen. El. Com. ..	$100	7	7	117 —121	..	5 15 8
Do. 7 % Pref.	$100	7	7	118 —122	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	3	5	1/16 — 1/8 xd	..	5 6 8
Do. 5 % Deb.	100	5	5	95 — 98	..	5 2 0
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	92 — 94 xd	..	6 7 8
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	86 — 89	..	5 12 4
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	95½ — 97½	..	5 2 7
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/16 — 3/16	..	Nil
Do. 6 % Pref.	1	6	6	1 1/16 — 1 1/8	..	8 14 6
Kaministiquia Power, 5% G. Bs.	$500	5	5	104 —106	..	4 14 4
Madras, Ord.	5	Nil	..	1⅛ — 2	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	102 —105	..	4 15 3
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	87 — 89	+ ½	5 12 4
Mexican Lt. & Power, Common	$100	4	4†	83½ — 86½	..	4 12 6
Do. 7 % Cum. Pref.	$100	7	7	103 —106	..	6 12 1
Do. 5 % 1st Mort. Gold Bds.	..	5	5	95 — 97	..	5 3 1
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	85½ — 87½	..	5 14
Montreal, Lt., H. and Power ..	$100	8	9†	227 —232	..	3 17 7
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5a	25 — 30	..	..
River Plate, Ord.	Stock	10	..	225 —235	..	4 5 1
Do. 6 % Non-Cum. Pref. ..	Do.	6	6	106 —111	..	5 5 3
Do. 5 % Deb. Stock	Do.	5	5	102 —104	..	4 16 2
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	98 —100	..	4 10 0
Shawinigan Water, Capital ..	$100	5	5	139 —143	..	3 10 0
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	+1	4 11 9
Do. 4½ % Per. Deb.	Stock	4½	4½	100 —102	..	4 8 3
Toronto Power, 4½ % Deb. ..	Do.	4½	4½	97½ — 99½ xd	..	4 10 5
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	92½ — 96½	..	5 3 8
Victoria Falls Power, Pref. ..	1	11¾d.	17¾d.	28/32 — 31/32	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103½ —105½	..	5 13 9

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4	4½†	7 — 7½	..	6 0 0
Do. 5 % Deb. Red.	Stock	5	5	97 — 99	..	5 1 0
American Telep. & Teleg., Cap.	$100	8	8†	142½ —144½	+ ½	5 10 9
Do. Collat. Trust	$1000	4	4	93 — 95	..	4 4 8
Anglo-American Telegraph ..	Stock	3	3	67 — 69	..	4 7 0
Do. 6 % Pref.	Do.	6	6	110½ —111½	..	5 7 8
Do. Def.	Do.	80/-	..	25/8 — 25/7	..	5 16 0
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	5	7	8	7 5/8 — 7 7/8	+ ⅛	5 1 7
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	80½ — 82½	..	4 17 0
Cuba Telegraph	10	6	6†	8½ — 9½	..	6 6 4
Do. 10 % Pref.	10	10	10	16 — 17	..	5 17 8
Direct Spanish Telegraph, Ord.	5	4	4†	3¼ — 3⅜	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	6⅞ — 7	..	7 2 10
Direct United States Cable ..	10	5	4	7 — 7½	..	6 13 4
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99 —101	..	4 9 0
Eastern Telegraph, Ord. Stock	Stock	7	7†	133 —136	..	5 3 0
Do. 3½ % Pref. Stock.. ..	Do.	3½	3½	77 — 79	..	4 8 7
Do. 4 % Mort. Deb.	Do.	4	4	96 — 98	..	4 1 8
Eastern Extension	10	7	7†	13 — 13½	..	5 3 8
Do. 4 % Deb.	Stock	4	4	96 — 98	..	4 1 8
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	98 — 101	..	3 19 3
Globe Telegraph and Trust ..	10	6	6†	10⅜ — 10⅞ xd	— ⅛	5 10 4
Do. 6 % Pref.	10	6	6	12⅜ — 12¾ xd	..	4 18 2
Great Northern Telegraph ..	10	18	18	27½ — 29½	..	6 2 0
Indo-European Telegraph ..	25	13	6†	56 — 58	..	5 12 1
Mackay Companies Common ..	$100	5	5	85 — 88 xd	..	5 13 8
Do. 4 % Cum. Pref.	$100	4	4	67 — 70 xd	..	5 14 4
Marconi's Wireless Telegraph	1	20	..	4 3/16 — 4 5/16	+ 1/16	4 11 4
Do. 7 % Cum. Partic. Pref.	1	17	..	3⅜ — 3⅝	..	4 7 8
Monte Video Telephone, Ord. ..	1	6	6†	1⅝ — 1 11/16	..	5 13 0
Do. 5 % Pref.	1	5	5	1⅝ — 1 11/16	..	5 18 6
National Telephone Def.	Stock	6	..	137 — 140	+1	..
New York Telep., 4½% Gen. Bnds.	100	4½	4½	97⅜ — 98⅝	..	4 11 2
Oriental Telep. and Elec. ..	1	8	6†	1 29/32 — 1 31/32	..	4 9 10
Do. 6 % Cum. Pref.	1	6	6	1 29/32 — 1 31/32	..	4 18 6
Do. 4 % Red. Deb.	Stock	4	4	88½ — 90½	..	4 8 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	98 —100	..	4 0 0
Reuter's	10	10	10†	10½ — 11	— ¼	9 1 10
Submarine Cables Trust ..	Cert.	6	6	127 —130	..	4 12 4
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99½ —101½	..	4 8 8
United River Plate Telephone	5	3	..	7⅛ — 7⅞	+ ⅛	5 3 3
Do. 5 % Cum. Pref.	5	5	5	5⅝ — 6⅝	..	4 8 11
West Coast of America	2½	2½	..	1 1/16 — 1 1/16	— 1/32	4 0 0
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	96 — 99	..	4 0 10
West India and Panama Teleg.	10	2½	1½†	3 — 3½	..	..
Do. 6 % Cum. 1st Pref. ..	10	6	6	10⅜ — 10⅝	+ ⅛	5 12 8
Do. 6 % Cum. 2nd Pref. ..	10	6	6	9¾ — 10	..	6 0 0
Do. 5 % Debs.	100	5	5	102 —104	..	4 16 2
Western Telegraph, Ltd. ..	10	7	7†	13 — 13½	..	5 3 8
Do. 4 % Deb.	Stock	4	4	95½ — 97½	..	4 2 1
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	97 —100		4 10 0

* Unless otherwise stated, all shares are fully paid. *a* Paid in deferred interest warrants. † Interim Dividend. ‡ 3s. in Funded Dividend Certs

CONTINUED ON NEXT PAGE.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912	Closing Quotations Dec. 21st.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	5/16 — 7/16	..	Nil
Do. 5 % Pref.	1	5	5	11/16 — 13/16	..	6 8 1
Do. 4½ % Deb.	100	4½	4½	76 — 81	..	5 11 1
Brit. Elec. Trac., 6 % Pref.	100	..	..	11½ — 13½	..	..
Do. Do. Deferred	100	..	..	5 — 7	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	87 — 89 xd	..	6 13 4
Do. 7 % Non-Cum. Pr'f.	100	..	..	39 — 42	..	..
Do. 5 % Perp. Deb.	100	5	5*	12 — 16	..	5 4 2
Do. 4½ % 2nd Deb.	100	4½	4½	77 — 81	..	5 7 2
Central London Railway, Ord.	100	8	8†	81 — 83	+1	3 12 3
Do. Pref.	100	4	4	83 — 85	+2	4 14 2
Do. Def.	100	2	..	80 — 82	+1	2 8 9
Do. 4 % Deb.	100	4	4	100 —102	..	3 18 5
City & South London, Ord.	100	1⅝	1¾†	35 — 36	+ ⅛	3 16 5
Do. 5 % Pref., 1891	100	5	5	109 — 111	..	4 10 1
Do. Do. 1896	100	5	5	109 — 111	..	4 10 1
Do. Do. 1901	100	5	5	109 — 111	..	4 10 1
Do. Do. 1908	100	5	5	109 — 111	..	4 10 1
Do. 4 % Deb.	100	4	4	98 — 100	..	4 0 0
Dublin United Trams, 6 % Pref.	10	6	6	12 — 13	..	4 12 4
Great Northern & City, Pr'f. Ord	10	Nil	Nil	2⅛ — 2⅜	..	Nil
Hastings Trams, 6 % Pref.	1	6	6†	7/8 — 15/16	..	8 6 8
Do. 4½ % Deb.	100	4½	4½	69 — 74	..	6 1 7
Isle of Thanet Trams, 5 % Pref.	5	2½	2½	2⅛ — 5/8 xd	..	4 15 3
Do. 4 % Deb.	100	4	4	77 — 82	..	4 17 7
Lancashire United, 5 % Deb.	100	5	5	81 — 83	..	6 0 6
London Elec. Railw'ys, 4 % Deb.	100	4	4	96 — 98	..	4 1 8
London United Trams, 5 % Pref.	10	Nil	..	5 — 6	..	..
Do. 4 % Deb.	100	4	4	72 — 75	..	5 6 8
Metropolitan Railway Consol.	100	1⅞	1¾†	53 — 53½	+1½	3 0 9
Do. Surplus Lands	100	2⅛	2¼†	62 — 64	..	4 6 0
Do. 3½ % Deb.	100	3½	3½	87 — 89	..	3 16 11
Do. 3½ % Pref.	100	3½	3½	85 — 87	..	4 0 6
Do. 3½ % Con. Pref.	100	3½	3½	84 — 86	..	4 1 5
Metropolitan District Ord.	100	Nil	Nil	40 — 40½	+ ¼	Nil
Do. 6 % Deb.	100	6	6	141 —143	..	4 4 0
Do. 4 % Deb.	100	4	4	95 — 97	+1	4 2 6
Do. 4 % Prior Lien	100	4	4	99 —101	..	3 19 3
Do. 4½ % First Pref.	100	4½	4½	88 — 90	..	5 0 0
Do. 3½ % Gtd.	100	3½	3½	76 — 78	..	4 9 9
Metropolitan Elec. Trams, Ord.	1	6	5†	1⅝ — 1⅞	..	5 1 1
Do. Def.	1	Nil	..	1/4 — 5/16	..	Nil
Do. 5 % Pref.	1	5	5	3/4 — 7/8	..	5 14 3
Do. 4½ % Deb.	100	4½	4½	93 — 95	..	4 14 9
Do. 5 % Deb.	100	5	5	94 — 97	..	5 3 1
Potteries, Ord.	1	3/8	..	7/16 — 9/16	..	..
Do. 5 % Pref.	1	5	5	13/16 — 15/16	..	6 19 0
Do. 4½ % Deb.	100	4½	4½	85 — 88	..	5 2 8
South Metro. Trams, 6 % Pref.	1	6	..	1⅛ — 1⅜	..	7 7 8
Do. 4 % Deb.	100	4	4	67 — 72	..	5 11 1
Underground Elec. Railways	10	..	..	4¼ — 4½	+ ⅜	Nil
Do. "A"	1/-	..	..	9/16 — 5/8	..	..
Do. 6% First Cum. Inc. Deb.	100	..	6	111 —113	—1	5 6 2
Do. 4½ % Bonds	100	4½	4½	100 —102	..	4 8 3
Do. 6 % Income	100	1½	£2	£2 — 93	+2½	..
Yorkshire (West Riding), Ord.	5	Nil	..	1/2 — 3/4	..	Nil
Do. 6 % Pref.	5	3	..	8 — 8½	..	4 5
Do. 4½ % Deb.	100	4½	4½	79 — 83	..	5 8

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	£⅞	4⅞ — 5⅛	..	4 17 9
Do. 2nd Pref.	5	5½	£⅞	4 1/16 — 4 1/8	..	5 17 4
Do. 4 % Deb.	100	4	4	93½ — 95½	..	4 8 9
Do. 4½ % Deb.	100	4½	4½	99 —101	..	4 9 1
Do. 5 % Deb.	100	5	5	97⅛ — 99½	..	5 0 6
Auckland Trams, 5 % Deb.	100	5	5	103¼ —105½	..	4 14 9
Bombay Elec. S. & Trams, Pref.	10	6	6	11⅜ — 12¼	+ ¼	4 18 0
Do. 4½ % Deb.	100	4½	4½	98 —100	..	4 10 0
Do. 5 % 2nd Deb.	100	5	5	99 —101	..	4 19 0
Brazilian Traction Light and Power	$100	..	..	91 — 93	..	..
Brisbane Trams Invt., Ord.	5	8	8†	7 1/16 — 7 5/16	..	5 9 5
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛	..	4 15 3
Dc. 4½ % Deb.	100	4½	4½	100½ —103½	..	4 7 0
B. Columbia Elec. Rly., Def.	100	8	..	139 —144 xd	..	5 11 2
Do. Pref. Ord.	100	6	6	117 —121	+ ½	4 19 2
Do. 5 % Pref.	100	5	5	106¼ —108½	..	4 11 4
Do. 4½ % 1st Mort. Deb.	40	4½	4½	98½ —101½	..	4 8 8
Do. 4½ % Vancouver Deb.	100	4½	4½	103 —105	..	4 5 9
Do. 4½ % Con. Deb.	100	4½	4½	97 —100	..	4 5 0
Calcutta Trams, Ord.	5	7	5†	5⅝ — 6⅛	..	5 14 3
Do. 5 % Pref.	5	5	5	4 15/16 — 5 1/16	..	4 16 5
Do. 4½ % Deb.	100	4½	4½	99 —102	..	4 8 8
Cape Electric Trams	1	2½	..	3/8 — 5/8	..	..
City Buenos Aires Trams (1904)	5	5	5†	5 1/16 — 5 1/8	..	4 8 0
Do. 4 % Deb.	100	5	5	99 —102	..	4 18 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	98 — 97	..	5 2 1
Havana Elec. Rly., 5 % Bonds	$1000	5	5	99 —103	..	4 17 1
Kalgoorlie Elec. Trams	1	Nil	..	1/16 — 3/16	..	Nil
Do. 5 % A Deb.	100	5	5	85 — 90	—1	5 11 1
Do. 5 % B Deb.	100	6	3	30 — 40	—4	..
La Plata Elec. Trms, Ord.	1	Nil	..	3/32 — 3 1/32	..	..
Do. Pref.	1	6	..	5/8 — 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	6	6†	1 — 1⅛	..	4 16 0
Do. 6 % Pref.	1	6	6	1 — 1⅛	..	4 16 0
Do. 5 % Deb.	100	5	5	93 — 97	..	5 3 1
Madras Elec. Tr. (1904), Deb.	100	5*	5	100 —102	..	4 18 0
Manaos Trams & Lt., 1st Deb.	100	5	5	89 — 92	..	5 8 8
Manila Elec. R. and Ltg., Bonds	$1000	5	5	100½ —102½	..	4 17 7
Mexico Trams Com.	$100	7	7†	109 —111	..	6 6 2
Do. Gen. Con. 5 % Bonds	..	5	5	95½ — 97½	..	5 2 7
Do. 6 % Bonds	100	6	6	101½ —103½	..	5 16 0
Para Elec. Rlys. & Lt., Ord.	5	10	10†	7⅛ — 7⅝	..	6 11 2
Do. 6 % Pref.	5	6	6	5 — 5½	..	5 9 1
Do. 5 % 1st Deb.	100	5	5	97 — 99	..	5 1 0
Perth (W.A.) Elec. Tr., Ord.	1	5	5½	1 3/32 — 1 1/16	..	3 14 5
Do. 5 % 1st. Deb.	100	5	5	99 —102	..	4 18 0
Rangoon El. Tr. & Sup., Pref.	5	6	6	5½ — 6	..	5 0 0
Do. 4½ % 1st Deb.	100	4½	4½	99 —101	..	4 9 1
Rio de Janeiro Trams, 1st Mort. 5 % Bonds	..	5	5	102 —104	..	4 16 2
Do. 5 % Mort. Bonds	100	5	5	96½ — 98½	..	5 1
Sao Paulo Tram, Lt. and P 5 % 1st Deb.	$500	5	5	102 —104	+ ½	4 16 2
Singapore Trams, 5 % Deb.	100	5	5	82 — 85	..	5 17 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	95 — 97	..	5 3 1
Un. Elec. Trams Monte Video	5	7	6†	5½ — 6	..	5 16 8
Do. 6 % Pref.	5	6	6	4⅞ — 5⅛	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	99 —102	..	4 18 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	99 —102	—1	4 8 3

MANUFACTURING COMPANIES.

Aron, Ord.	1	6	..	1/8 — 3/8	..	8 0 0
Do. 6 % Pref.	1	6	6	2 1/16 — 2 3/16	..	7 13 11
Babcock & Wilcox	1	28	14†	3 — 3⅛	..	4 6 2
Do. Pref.	1	6	6	1⅜ — 1⅝	— 1/16	4 0 0
British Aluminium, Ord.	1	Nil	..	3/8 — 7/16	..	..
Do. 6 % Cum. Pref.	1	Nil	..	1/16 — 1/16	..	..
Do. 5 % Prior Lien Debs.	100	5	5	91 — 94	..	5 6 5
Do. Deb. Stk.	100	5	5	86 — 89	..	5 12 4
B.I. & Helsby Cables	5	10	8†	7⅞ — 8	..	6 5 0
Do. Pref.	5	6	6	5⅞ — 6⅛	..	4 14 1
Do. Deb.	100	4½	4½	103 —105	..	4 5 9
British Thomson-Houston, Deb.	100	4½	4½	94 — 96	..	4 13 9
British Westinghouse, Pref.	8	Nil	Nil	3/32 — 5/32	..	Nil
Do. Deb.	100	4	4	58 — 61	..	6 11 2
Do. 6 % Prior Lien	100	6	6	100 —103	..	5 16 6
Browett, Lindley, Ord.	1	..	..	2/- —3/-	..	Nil
Do. Pref.	1	..	..	4/6 —5/-	..	Nil
Brush, 7 % Pref.	2	Nil	Nil	0 — ¼	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	75 — 80	..	6 5 0
Do. 4½ % Deb.	100	4½	4½	47 — 52	..	8 13 2
Do. 4½ % Second Deb.	100	4½	4½	30 — 34	..	13 4 8
Callender's Cable	5	15	10†	10¼ — 11½	..	6 13 4
Do. Pref.	5	5	5	4½ — 5⅛	..	4 17 7
Do. Deb.	100	4½	4½	99½ —101½	..	4 8 8
Castner-Kellner	1	20	20	3⅜ — 3½	..	5 6 8
Do. Deb.	100	4½	4½	106 —109	..	4 2 7
Crompton & Co.	8	Nil	..	1/8 — 3/8	..	Nil
Do. Deb.	100	5	5	56 — 66	..	7 11 6
Dick, Kerr	1	5	Nil	2 1/16 — 2 3/16	..	..
Do. Pref.	1	6	6	3/4 — 7/8	..	6 17 2
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Edison & Swan, A, £8 paid	5	Nil	..	1/8 — 3/16	..	Nil
Do. fully paid	5	Nil	..	1 — 1⅛	..	Nil
Do. 4 % Deb.	100	4	4	65 — 69	..	5 16 0
Do. 5 % Second Deb.	100	5	5	72 — 75	..	6 13 4
Electric Construction	2	2½	3⅜	1 1/16 — 1 1/8	..	7 1 4
Do. Pref.	2	7	7	1 15/16 — 2	..	7 0 0
Greenwood & Batley, Pref.	10	7	7	7⅝ — 8	..	8 5 8
Do. Deb.	100	5	5	92 — 94	..	5 4 2
General Electric, Pref.	10	5	5	10 — 11	..	..
Do. Deb.	100	4	4	90 — 95	..	4 4 3
Henley's, Ord.	5	17	5†	12½ — 13	..	6 10 9
Do. Pref.	5	4½	4½	4 15/16 — 5 1/16	..	4 9 0
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
India-Rubber, G. & T.	10	..	7½	10 — 11	+ ½	6 16 4
Do. Pref.	10	5	5	9½ — 10½	..	4 17 7
Telegraph Construction	12	17½	5†	34½ — 36½	..	5 13 0
Do. Deb.	100	4	4	97½ —100½	..	3 19 6
Willans & Robinson	1	Nil	..	1/16 — 1/16	..	Nil
Do. Pref.	5	Nil	..	1/2 — 3/4	..	Nil
Do. Deb.	100	4	4	57 — 59	..	6 15 7

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING NOVEMBER, 1912.

ALTHOUGH, compared with the previous month's figures, those for November show a striking reduction in value, yet the total of the exports—£468,465—contained a comparatively small proportion of telegraphic material (valued at £38,467, as compared with £234,311 in October, when the conditions were abnormal), and represents a figure above the average of the earlier months of the year.

The imports, valued at £252,672, compare with £267,328 in the month previous, but the November re-exports, at £30,204—a figure above the average—were an improvement on the October total of £27,491.

As might be anticipated, the export figures were lower all round as compared with those for October; the value of machinery exported, however, reached £177,000 approximately, while the other staple export, cables, was valued in total at nearly £100,000. The import figures show less variation than the foregoing, although it may be noted that Germany's share of the business was some £30,000 less than in the previous month.

Foremost of our own customers during the month was Japan, and it is a sign of the times that Canada occupied the second position in regard to value, outdistancing such well-known purchasers as Argentina, India, our Australian Colonies and New Zealand.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Destination of exports and country consigning imports.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric glow lamps.	Electric arc lamps and lamp parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	1,063	700	122	69	69	260	8,025	571	964	56	977	321	13,197
Germany	2,520	4,057	4	...	573	58	1,960	300	5	...	35	74	9,586
Netherlands, Java & Dutch Indies	510	2,627	109	31	29	62	1,664	...	12	...	17	753	5,814
Belgium	766	1,070	435	...	422	23	2,609	136	...	25	689	108	6,283
France	961	...	4,762	...	61	44	13,259	734	2	28	94	464	20,409
Portugal	194	205	107	143	12	...	171	...	180	...	161	372	1,545
Spain, Canary Isles and Spanish N. Africa...	1,975	3,520	160	...	537	678	6,868	920	12	...	101	369	15,140
Switzerland, Italy and Austria-Hungary ...	315	91	293	12	136	9	5,774	408	38	372	...	2,401	9,849
Greece, Bulgaria, Roumania and Turkey ...	155	167	...	...	...	...	607	...	103	...	268	513	1,813
Channel Isles, Gibraltar, Malta and Cyprus...	48	426	196	86	...	76	266	...	...	...	12	170	1,280
U.S.A., Philippines and Cuba	560	10	53	...	45	108	1,298	215	11	20	...	502	2,822
Canada and Newfoundland	1,113	5,313	1,586	1,365	...	4,593	14,341	...	12,447	...	1,049	470	42,277
British West Indies and British Guiana ...	33	10	192	96	12	...	281	...	77	...	43	...	744
Mexico and Central America	413	36	51	75	...	...	152	...	23	...	15	374	1,139
Peru and Uruguay	1,030	30	312	280	...	...	1,331	...	192	...	20	1,535	4,728
Chile	2,212	464	172	202	52	411	2,608	37	242	17	170	2,122	8,709
Brazil	845	535	551	872	...	40	6,629	223	325	155	15	7,906	18,096
Argentina	1,300	10,798	231	473	171	605	7,176	1,169	1 860	210	4,629	1,542	30,164
Colombia and Venezuela	...	...	1,323	...	...	...	785	...	120	...	12	...	2,240
Egypt, North Africa and Persia	184	226	72	35	...	80	382	359	152	...	353	1,412	3,255
British West Africa	100	204	70	35	...	...	291	...	23	...	30	193	946
Rhodesia, O.R.C. and Transvaal	1,694	1,683	463	544	10	351	2,722	32	116	...	199	83	7,827
Cape of Good Hope	1,736	4,327	506	367	...	668	2,387	307	1,748	92	297	653	13,086
Natal	750	6,120	376	...	...	66	3,482	...	598	...	214	40	11,646
Zanzibar, Brit. E. Africa, Mauritius and Aden	81	259	58	82	12	1,408	470	86	100	...	5	5,221	7,776
Azores, Madeira and Portuguese Africa ...	176	534	179	117	...	14	386	120	27	14	54	734	2,355
French African Colonies, Madgascar, &c. ...	1	29	...	...	...	...	356	...	...	4	...	14	404
China and Siam	786	1,187	95	1,538	...	242	7 342	2	89	...	370	...	11,651
Japan and Korea	1,512	11.169	373	...	16	2,811	16.244	1,427	6.218	17	7,562	1,460	48,809
India	4,260	15,868	3,514	2,268	150	842	3 899	1,000	2,198	230	402	2,988	37,619
Ceylon	505	2,173	262	118	...	27	1,318	...	33	14	1,001	139	5,590
Straits Settlements and Federated Malay States	261	1,479	310	38	...	519	1.601	530	83	...	44	1,583	6,448
Hong Kong	464	203	133	234	...	22	2.888	....	29	81	69	...	4,123
West Australia	470	756	128	374	...	368	843	17	47	...	808	276	4,087
South Australia	431	1.025	78	151	...	84	3.269	16	113	...	142	59	5,368
Victoria	3,554	9,975	902	471	107	134	9,103	584	4,440	...	653	73	29,996
New South Wales	880	4,846	994	282	147	1,462	17,841	615	384	11	1,972	2,453	31,887
Queensland	71	1,453	...	325	...	305	696	...	...	...	1,681	802	5,333
Tasmania	127	...	99	...	...	3	11	...	...	...	...	94	334
New Zealand	1,872	3,973	1,314	96	27	1,120	15,066	690	316	27	9,363	196	34,090
Total, £	35,928	97,542	20,585	10,779	2,588	17,493	166,401	10,498	33,357	1,373	33,454	38,467	468,465

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Russia, Norway, Sweden and Denmark ...	128	...	...	142	7	...	12,568	95	606	33	14,436	28,015
Germany	10,645	4,571	1,430	19,985	12,180	2,574	60,822	310	5,394	7,767	27,890	153,566
Holland	33	...	...	1,809	408	...	...	...	8	220	920	3,398
Belgium	672	2,569	...	220	103	30	3,858	5	194	122	5,577	13,350
France	531	8	835	1,577	228	824	3,732	75	1,059	3,395	1,453	13,717
Switzerland	121	2,345	...	60	65	234	1,297	...	...	31	45	4,198
Italy	14	322	...	52	4	...	20	...	...	...	4,011	4,423
Austria-Hungary	...	687	...	483	144	...	178	...	...	1,031	...	2,523
United States	4,193	425	743	116	145	577	12.247	9,788	346	62	86	28,728
Total, £	16,337	10,927	3,008	24,444	13,284	4,239	94,722	10,273	7,607	12,659	54,418	251,918

Additional imports: Canada, goods, £310; machinery, £15; Spain, carbons, £429.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

Various countries, mainly as above ...	17,868	768	...	1,671	205	...	7,987	...	316	577	812	30,204

TOTAL EXPORTS: £468,465. TOTAL RE-EXPORTS: £30,204. TOTAL IMPORTS: £252,672.

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns. Imports are credited to the country whence consigned, which is not necessarily the country of origin.

INDUSTRIES AND INDUSTRIAL CONDITIONS IN THE ARGENTINE.

By ALFRED H. GIBBINGS, A.M.I.C.E., of Buenos Ayres.

(*Concluded from page* 1014.)

Fuel and Motive Power.—The question of fuel is of paramount importance in any country, and more particularly in a country of such vast area as the Argentine, where motive power is wanted in all parts. The country produces three classes of fuel, viz., coal, petroleum, and a very hard wood, called "quebracho." Each of these, however, is found at points very remote from the industrial area—so far away, in fact, that the cost of transit alone puts them out of the running with imported fuels. Quebracho wood is brought into Buenos Ayres from the forests of Tucuman and Entre Rios, but is only used for domestic purposes in place of coal. Coal is found but in small quantities in some of the outlying mountain ranges of the Andes, and is very poor in quality. Petroleum has been discovered in Commodore Rivadavia, in the south-east of the Territory of Chubut, and is being worked to a very limited extent. At present the quantity obtained from the few wells sunk is so small that it is of no commercial importance, but some of the locomotives of the Patagonian Railway are using it instead of coal. The oil, moreover, is of poor quality, being only 50 per cent. of the calorific value of Texas or Mexican oil. There are very complete Government reports or Blue Books issued on this oilfield, containing chemical analyses and comparisons with the well-known oilfields of the world.

The object here, however, is only to point out the conditions which exist at present, and it will be seen from the foregoing remarks that the Argentine is really dependent upon importation of coal and petroleum. The present price of good Welsh coal in Buenos Ayres, Rosario, Bahia Blanca, and the other ports is about £2 5s. per ton, and petroleum (crude and in 40-gallon barrels) about £7 per ton. There are practically no facilities for storing petroleum in bulk, but a large fleet of tank steamers is now being built by a British firm for importing to the Argentine about 1,000,000 tons of crude petroleum per annum. Crude petroleum is used for both firing boilers, and in the "Diesel" type of engine. Anthracite is also imported for domestic heating in slow-combustion stoves, and for producer-gas plants.

The motive power in general use is (*a*) steam; (*b*) internal combustion engines using crude petroleum, paraffin, petrol, town's gas, and producer gas; and (*c*) electricity from public supply mains. Steam power is general for all large undertakings, but in some of these cases the Diesel engine is replacing it owing to improvements in design, and particularly as regards reliability. Producer gas plants are not in great vogue, owing to the great difficulty of obtaining sufficiently intelligent men to look after them. At this juncture it may usefully be stated that comparatively small differences between the economy and efficiency of the several classes of prime movers do not appeal to the power-user here. What he wants above all things is reliability, and this can well be understood where any breakdown would mean many days, possibly weeks, before repair could be effected, thereby wiping out any small advantage due to high efficiency, and entailing in addition a very serious loss. Moreover, in a country where everything is expensive and money is plentiful, profits are correspondingly large, and the refinements of economical operation are put on one side.

The largest electric power supply undertaking in South America is the Cia. Alemana Transalantica de Electricidad, of Buenos Ayres, whose network of mains spreads over the whole city. This company has over 100,000 KW. of plant, and by the end of 1913 it is anticipated to reach 150,000 KW. The system of supply is three-phase at 225 volts and 50 periods, and direct current at 220 and 440 volts.

The number of units (KW.-hours) sold in 1911 were :—

Power	18,200,496
Traction	63,718,787
Light	46,909,629
Total	128,828,912

The cost for power averages 5d. per KW.-hour, and for light 10d. per KW.-hour. Electricity supply is also given by the Lacroze Co. and recently there has been formed the Compania Italo-Argentino de Luz y Fuerza to operate competitively in the same area. There are about 40 electric supply undertakings in the provinces, in fact, nearly every town of over 5,000 inhabitants is dependent on electricity for light as well as for power. It is noteworthy that nearly the whole of this enterprise is in the hands of Germans, Belgians or Italians. Great Britain is out of it.

Raw Materials.—The raw materials produced in the country include many metals, with the exception of iron. Steel is manufactured on a small scale in Buenos Ayres, but is employed for small castings only. The minerals embrace granite, marble of excellent quality, slate, china clay, soft stone, sandstone, graphite, chalk, lime, sand, asbestos, mica, and sulphur. There are over 200 varieties of woods of every class and character, india-rubber trees, and a great variety of grasses and willows suitable for wicker work.

Among the by-products may be mentioned skins from the slaughter of over 20,000 animals per day, some of which hides are tanned, others being salted and exported. It is apparent, therefore, that there is ample raw material for manufacturing processes, and without doubt the country will in the near future develop into a manufacturing as well as an agricultural and cattle-rearing centre.

The Position of the British Trader.—These articles would not be complete without some brief reference to the position and interests of the British trader. The term "British Trader" is somewhat a misnomer, especially as regards the manufacturer in England, as in comparison with the business propaganda and hustle of the German, Belgian, Italian and North American, he is conspicuous by his absence. This statement will be at once met by citing the statistics of imports into the Argentine, than which statistics there are no more fallacious indications.

The imports into the Argentine for 1907, 1908 and 1909 are given in Table I, from which it appears that Great Britain holds 33 per cent. of the total imports into the country. This is an indisputable fact, but when subject to analysis it is found that out of the 33 per cent., no less than 25 per cent. is for railway material. Now the railways are practically all owned by British shareholders, controlled by British boards of directors, and have the privilege of importing all their material duty free. Further, the goods are nearly all ordered direct from the London offices, without necessitating representation of the manufacturing and supplying firms in Buenos Ayres. Hence we have the net result of British manufacturing firms' interests in the Argentine limited to about 8 per cent. of the total imports so far as they relate to the industrial trade of the country. This result is being rapidly diminished year by year, due entirely to the apathy, short-sightedness, or too-prosperous position of the manufacturer at home. And it does not merely apply to the Argentine, but to the general export policy of Great Britain, whether appertaining to other foreign countries or the Colonies as will be emphasised hereafter.

The trade, as regards supplying industrial requirements, is split up approximately as follows :—

Great Britain.—Agricultural machinery, cranes, coal, cotton goods, leather goods, hats, clothing, tools, steel, steam engines and a few general specialities.

Germany.—Government contracts, engines (especially gas, oil and hydraulic plants), electrical apparatus and plant of every description, cranes, steam and petrol launches, automobiles, brick-making machinery, textile plant, paper-making plant, printing machinery, steel girders and stanchions, &c.

France.—Electric lifts (by far the larger proportion), all fancy articles, dress goods, household requisites, wines.

Belgium.—Finance of industrial undertakings.

Switzerland.—Watches and clocks, fancy goods.

United States of America.—Machinery of all kinds, boots and shoes, stationery and characteristic products.

Italy.—Electrical plant, telegraph plant, provisions and wines. Nearly all the cafés, catering, and practically the whole of the electrical wiring industry, are in Italian hands.

Of the foregoing some anomalous conditions exist. For example, the cold storage undertakings, of which the British hold a fair control, are rapidly becoming absorbed in the

North American combines. Then the recent large contract for the new underground electric railway has been given to Philip Holzmann & Son, the work being associated with the Anglo-Argentine Tramway Co., which is entirely a German concern. The Rosario Electric Light and Power Co., formerly a British concern with an English board of directors, has been bought out by a Belgian syndicate.

Numerous other instances could be cited, the emphatic point being that wherever British interests can be ousted by foreign capital, the British manufacturer no longer has any market for his goods.

There is of necessity a reason for this state of affairs, which the English engineer or representative finds hinself up against. The following enumeration may help to elucidate the mystery :—

1. Nearly all foreign houses provide plenty of war funds for an active campaign. They are not content with agents or representatives, but have their own branch houses, with their own staff of officials.

2. Foreign firms adapt themselves and their business methods to the requirements of, and intimate association with, the local conditions and market, in contradistinction to the attitude of British firms.

3. The traveller for these foreign houses is a linguist, knowing generally English, German, French and Spanish. He sells customers what they want, not what they ought to want.

4. The English settler or local business man will buy from the German, French, or other nationalities, but the other nationalities do not buy from the Britisher.

5. The foreign firm sells from *stock*. He also gives reasonable credit, and the customer sees what he is buying, The British firm invariably asks for cash against shipping documents in London, takes no risk, will not guarantee delivery, and the customer may wait from three to six months for his goods.

6. The British build railways, run ships, supply coal, and practically guarantee the financial stability of these young progressive countries to facilitate the trade of foreign competitors.

In the Argentine it is fast becoming impossible to take orders for deferred delivery. Supply from stock on the spot is insisted upon, and enormous stocks are kept by dozens of first-class firms of engines up to 250 H.P., boilers, agricultural machinery, traction engines, motor-cars, and of every conceivable commodity and in every variety of size.

In a recent negotiation, the writer was informed by a firm who wished to be represented in the Argentine that "our experience shows us that an important agency such as we are able to confer demands that the agent should have adequate capital to efficiently work the business." The underlying note here is that the name and quality of the goods were alone sufficient to guarantee a market—a fallacy which would be quickly apparent by a visit to the country in question, to say nothing of the other conditions already referred to. The "conferring" of an agency is ideally characteristic of the attitude, but the illogical position of an agent spending his own capital—probably several thousand pounds—for the doubtful privilege of being tied up to one firm is entirely overlooked. In such a case, it is obvious that the agent would be able to buy in the best open market. After all, this "conferring" attitude is a relic of the old *régime*, which is rapidly passing away.

With regard to the Colonies a very similar position exists, of which some striking evidence is given in *The Export World* for November, 1912, page 207, in an article entitled "Are we losing Canadian Trade?" by an Englishman in Canada.

In a recent paper read before the London Chamber of Commerce on Argentine trade, it was stated that "warships go to the United States, great electricity and lighting contracts go to the Germans, dock and harbour works go to the French." The writer can add that crane contracts go to the Germans, electric lighting and tramway concessions go to the Italians, and that out of 15 tenders for Government contracts during the last 12 months, that of the writer's firm was the only British tender put in.

Water-Power.—A scheme of great importance has recently been presented to the Government for the utilisation of the rapids at "Salto Grande," on the River Uruguay (some 15 miles above the town of Salto), for the generation of electric energy, which should be transmitted to towns on both banks of the river, and possibly even as far as Monte Video and Buenos Ayres.

The scheme also provides for the construction of navigable channels through the rapids, which at present form a complete bar to the navigation of the river at that point, and for a plan of irrigation.

The promoter of the scheme is Senor Antonio Piaggio, a Uruguayan engineer, formerly Director of Traffic in the Port of Buenos Ayres, and he is understood to have the support of Argentine, Uruguayan and foreign capitalists. The capital required is $12,000,000 gold, or about £2,550,000.

The precise financial and technical details of the scheme have not yet been made public, but it is believed that the proponents ask a concession for 90 years, in return for which they offer to hand over to the Government 5 per cent. of the gross receipts and to supply it with a given amount of electric energy at half the current price.

They also undertake to obtain from the Argentine Government the permission necessary to carry out the works on that side of the river, which is under Argentine control.

The utilisation of the abundant water power of Uruguay for conversion into electric energy is an idea which has been present for some time past, and it is bound to be carried out sooner or later, whether by the present scheme or by others. In fact, it is easy to foresee that it is destined, at no remote future, to play a very important part in the economical development of the country, precisely supplying that lack of fuel, which is one of the chief obstacles to its industrial advance.

With an unlimited supply of cheap energy drawn from its rivers, and with the development of its mineral resources that may also be expected before long, Uruguay should rapidly advance from the pastoral and agricultural to the industrial stage, manufacturing its own raw materials both for home consumption and for export, and it is no mere freak of the imagination to see her becoming the Belgium of South America, supporting a population, not of 1 million as a present, but of 20 or 30 millions.

Reference has already been made to the other water-power schemes at Cordoba and Tucuman.

The Protection of Trade Interests.—There exists in Buenos Ayres an industrial organisation known as "La Union Industrial Argentina," which has for its object the protection of trade interests of every kind.

It is composed of representatives of every class of industry, both manufacturing and selling, wholesale and retail. It is divided into "Sections," each being concerned with some particular branch of trade, and these Sections nominate members for the General Council. The General Council consists of a President, two Vice-Presidents, Honorary Secretary, Acting Secretary, Treasurer, Legal Adviser, Delegates, and "Suplentes," which latter are special members elected to watch over the interests of Sections.

The Association includes many nationalities, and its strength and importance are very far-reaching.

The professional element is also strongly represented, especially lawyers, but the Union is a business association entirely.

This Union issues a monthly "Boletin," consisting of about 70 pages, and contains excellent articles and statistics of international progress in trade by recognised authorities. The issue for September, 1912, contained articles on "The Protection of the Constitution," "English Industrial Insurance," "Economical Crisis from 1912 to 1917," "The Sugar and Mining Industry in Columbia," "Discovery of Minerals in the Argentine," "The Importation of Books," "Exportation of Flour," "Superfluous Inspections of the Department of Hygiene," "The National Press," "The Right of Inspection of Machinery," "Various Subjects," and "Patents of Invention," and others of equal interest.

It is very doubtful whether any other country in the world can show so much united and comprehensive force in one organisation.

In addition to including amongst its members many members of the National Congress, and possessing chemical and other laboratories for experiment and research, it is in the favourable position of having the strongest support of the Government, who desire by all

means to encourage local industry and new industries. Each Section also has its president, vice-president, treasurer. secretaries and officials.

The Union in association with the Municipality of Buenos Ayres also issues from time to time Grand Diplomas of Honour, Gold Medals and Silver Medals for excellence of workmanship and quality of materials.

Security of Capital and Stability of Trade.—On this subject the Argentine Year-Book says:—"Nothing could be finer than the conception of the Argentine Constitution, the provisions of which are based upon the highest principles of Liberty, Justice and Equality. Every inhabitant of the Republic has the right to engage in any lawful commerce or trade, to petition the authorities, to enter, remain upon, travel over, and leave Argentine territory at will, to publish his ideas in the Press without prohibition, to use and dispose of his property, to form part of any society or association having useful ends, and to practise his religion freely.

"Property is inviolable. Every author and inventor is given the sole rights of the products of his genius for the period allowed by law. A man's dwelling place is inviolate as are also his correspondence and his private papers. Strangers enjoy within the Republic all the civil rights of citizens, with liberty to exercise their trades, industries or professions."

The stability of trade is amply emphasised by the annual official statistics of the growth of the nation in every direction. Some of the principal indications of the extent of business increase here are the congestion of the port, the enlargement of the docks, for which the contract has been given to Messrs. C. H. Walker & Co., Ltd., of London, and the large annual percentage increase in both the exports and the imports.

Licences.—Special licences are required by every trader in Buenos Ayres, and other licences for the several provinces.

REVIEWS.

Modern Illumination. Theory and Practice. By Horstmann and Tousley. London: American Book Supply Co., Ltd. Price 8s. 6d. net.

The authors of this admirable work supply a long-felt want, insomuch that they present a book that deals solely with the subject of "Light and Illumination" from a practical point of view. There is a prevailing idea that the illuminating engineer is a quite unnecessary person, and that illuminating engineering is in itself child's play, but we believe that after even a hasty perusal of the little volume now before us, these ideas would disappear, and in their place one would wonder at one's lack of knowledge and method on such an important subject. It is, indeed, to be hoped that the illuminating engineer will be allowed to justify his name and induce all to take a much more lively interest in good and efficient lighting than has been the case heretofore. Messrs. Horstmann and Tousley certainly help this propaganda and enable one to attain such an understanding of illumination as has up to the present been impossible.

It gives one much pleasure to take up a book which puts before its readers in an understandable and logical manner the subjects which it purports to treat upon. At the commencement we are introduced to the more elementary principles, and after a chapter or so on photometry and calculations, the latter, by the way, being devoid of anything abstruse, we become acquainted with the characteristics of electrical illuminants. These are given at great length, and practically all known types of electric lamps are dealt with; the following points taken at random will suffice to illustrate the utility of the chapter to those interested:—Voltage, current used, rating in candle-power, colour of light, natural distribution of light, life of carbons, general advantages, general objections, and practical hints.

The frequent allusion to certain specialities stamps the book as being written for American readers, and in this respect an English edition would not be amiss, especially if it were printed on thin paper, for, though of pocket size, the present publication is a somewhat weighty volume.

The natural sequence to the chapter on lamp characteristics is a section on shades and reflectors, and following this we learn of the best location and height of lamps, colour of light, choice of lamps, and choice of fixtures. Indirect lighting is becoming quite general, so that a chapter concerning this is by no means out of place.

The practical considerations are well worth perusal, and they should be a very great help to those whose business it is to advise others as to the intensities and arrangements necessary to provide good and efficient lighting for their requirements, for the applications dealt with are most comprehensive.

The authors justly lay great stress upon plans and specifications; the tables which complete the work should enable one to obtain definite figured results, provided that the specification is drawn up on the recommendations and facts stated therein. It augurs well for the utility of a volume when the index is comprehensive, and in this respect "Modern Illumination" is well served, so that it is a work for quick and ready reference. On the whole, all concerned are to be congratulated upon the reliability of the book, for only in one or two places does a slight error appear to have crept in. We have no hesitation in recommending the purchase of such a handbook as this to all.

Mémoires sur l'Electricité et l'Optique. By A. Potier. Paris: Gauthier-Villars. 1912. Price 13 fr.

This collection of the writings of A. Potier is prefaced by two interesting and touching appreciations by H. Poincaré and by A. Blondel. Poincaré, in giving a short sketch of the career of this remarkable man, says that few of those who knew Potier as the calm rather austere and absent-minded professor of abstract science, suspected that the little red ribbon in his button-hole referred to his work as a soldier in 1870, when he distinguished himself in several of the engagements in the environs of Paris. A man whose life was for years ravaged by the cruel disease from which he eventually died, his courage and control never deserted him, and to the end he bore himself with tranquil serenity and unclouded mental activity. A few weeks before his death he asked for books that he might take up a new mathematical study.

Maxwell's theories were not well received on the Continent, not so much on account of their method or their conclusions, as for the experimental and non-mathematical work of Faraday from which they started. The great champion of Clerk Maxwell in France was Potier. His name is not well known in England, nevertheless his *rôle* was as great in electrical science as that of Ferraris in Italy, and though he made no sensational discovery his writings on optics are of the first order. Prof. Blondel in collecting and editing these papers pays affectionate tribute to the modesty and disinterested character of his master. To this it is due that the world has known so little of him, though his help and knowledge were generously placed at the service of the physicist or manufacturer who wished to consult him.

Potier was essentially a mathematician, and yet he appears to have produced but little original mathematical work. The list of writings not included in this volume includes papers on thermodynamics and geology. From the point of view of electrical engineering it is remarkable that a man born in 1840, and succeeding Edmond Bequerel in the Académie des Sciences in 1891, should have applied his intellect to alternating-current engineering, particularly to the theory of asynchronous motors, and of alternators. His mathematical work on these was not of the "ironless" type that used to bewilder and discourage students some 25 years ago, and yet he seems to have carried out little, if any, experimental work. In optics, too, he seems to have seized on the essential features of contemporary work, and applied his mathematical ability to carrying it a step further.

One cannot help regretting that Potier had not been born 20 years later, for some of the subjects on which he wrote were in their infancy. For example, his paper for the Société Internationale des Electriciens on the precautions to be taken against electrolysis in connection with electric tramways was written in 1896. He pointed out that the

return feeders without boosters entailed a huge expenditure of copper, and discussed various methods of returns, graphically and otherwise. But the conditions of modern practice have advanced, and this paper serves mainly as a hint for others to work upon.

The volume owes much to the valuable notes by Prof. A. Blondel.

Boiler Explosions. By E. P. RIMMER. London: Constable and Co., Ltd. 1912. Price 4s. 6d. net.

This book, written by a barrister and introduced by a K.C., tells us that there have been 2,000 inquiries held under the Boiler Explosions Act of 1882. It has been our fortune to be present at some of these and to note the huge mass of useless verbiage through which the inquiry drags itself, the thousands of questions put to witnesses by learned counsel absolutely ignorant of the subject on which they try to look so wise, the browbeating of honest witnesses by some counsel, whose one aim is not to elicit truth, but to shield one party at the expense of another. To an engineer it is a pitiable and lamentable sight. That such inquiries are conducted by the Board of Trade is, unfortunately, no guarantee that all is well. It may not be so bad now, but in the early days of the Act, the reports of marine surveyors on happenings to land boilers did not tend to make an engineer feel so very safe as a passenger at sea in a vessel passed as safe by a B. of T. inspector. The author of this work, though a barrister, seems to have come to the conclusion that the voluntary boiler insurance companies know more about their work than the Board of Trade can teach them, and in this we do not think he is far wrong. At the same time, when he says the boiler insurance companies guarantee the safety of the boiler, it is not quite clear what he means. What they do is to pledge themselves, under certain conditions, to pay a fine should the boiler fail. We believe the Manchester Steam Users' Association do this to the fairly liberal extent of £2,000, while the insurance companies issue policies, with amounts according to premium. The risk of a boiler explosion is now a very small risk, but, unlike fire offices which take risks and do not inspect, the boiler insurance companies spend probably the bulk of their premium income in the work of inspection. Readers must have noticed in cases of certain explosions that boiler insurance companies will make recommendations, which boiler owners have for years continued to ignore. If the Insurance Co. say "we will no longer insure your boilers unless you remedy these faults," the owner may try to place his insurances elsewhere. This has been done, and competition in boiler insurance has occasionally led to courses which are dangerous. Hence the advantage of the M.S.U. Association system.

The Association will continue to inspect, and will draw the equivalent of the premium payment, but it suspends its guarantee pending attention to the faulty matters in dispute. With the fatuity of our lawyer-drafted Acts of Parliament, a boiler owner must have his boiler inspected periodically by a competent person, but there is no definition as to competency. According to recent decisions it is a serious matter for any engineer to profess to be in charge of steam boilers if he is not technically competent. A chief engineer of an electric light station was heavily fined on account of an explosion at his station, because he was not a steam engineer, however able he might have been as an electrical engineer. There are hundreds of electrical men in a similar position, and the knowledge of this was public property in the world of engineers, for steam men had been loud in their complaints that electrical men had been put in charge of steam plant. Had our Board of Trade had reasonable wisdom beforehand—any decent sort of prevision—would they have waited for a fatal boiler explosion before declaring that who tends fat oxen should himself be fat? It was at least unkind to let an electrical engineer put his neck in a noose without warning him. Of course, the Board will say they were not cognisant of the fact. But that is just what they should have been, or why do we have such a Board, if not to put things right before disaster?

The author is, we think, to be congratulated on the way he has compiled his book and the extracts which he has inserted from various reports. We think, however, that many engineers will join with us in the wish that inquiries into accidents should be conducted in a different manner, and with less cost and waste of time. It is really absurd to watch half-a-dozen bewigged, and often befogged, counsel puzzling themselves and confusing witnesses by their futile questions on technical points.

We believe it is still true, as pointed out some years ago by Mr. Longridge, if memory serves us right, that the measure of safety secured by our English boiler insurance system is superior to that obtained either by German State Control or by our own Board of Trade, which supervises marine boilers.

The Una-Flow Steam Engine. By PROF. J. STUMPF. London: Constable & Co., Ltd. Price 10s. 6d. net.

The author of this work, in spite of his professorial duties at the Technische Hochschule, Charlottenburg, appears to have evolved a new type of steam engine (known as the "Una-flow" engine), and not only this, but to have been much more successful than the large majority of inventors, in that more than a year ago, we are told, there were Una-flow steam engines with a total output of over half a million horse-power either working or in actual construction. The first Una-flow engine was built by the Erste Brunner Maschinenfabrik-Gesellschaft, of Brunn, and was an immediate success, having a steam consumption equal to that of a good compound engine, whilst the first Una-flow locomotive is still in satisfactory use on the Moscow-Kazan Railway. Primarily the idea of the inventor was to perfect an engine of the uni-directional flow type, doing with one cylinder what is usually done with several cylinders. This is accomplished somewhat on the lines of the steam turbine, where the steam enters at a high temperature, and has its energy extracted as it passes axially and always in the same direction to the cold exhaust. The success of the uni-flow system depends on an early cut-off and the use of a large expansion ratio, whilst the hot end must be kept hot and the cold end cold. The author shows that the steam consumption of his engine is the same as, if not better than, that obtainable with an ordinary type of engine, whilst the cost of building and lubricating a Una-flow engine is much less. The working steam enters from below the cylinder into a hollow cover, which it heats, then passing by a valve in the upper part of the cover into the cylinder, it does its work on the piston, and, after it has been expanded, passes out at the end of the piston stroke by a ring of exhaust ports arranged in the middle of the cylinder, and controlled by the piston. By thus avoiding the counterflow of steam that takes place in ordinary steam engines, Prof. Stumpf claims that cooling of the clearance surfaces is almost entirely avoided, and hence "cylinder condensation is to a great extent eliminated, as also is the necessity of employing several expansion stages." Thus the gauntlet is very definitely thrown down before the supporters of triple and quadruple expansion engines, but these will be quite able to defend their products, no doubt. An interesting result of the large cross-section of the exhaust passage is that, by arranging for the condenser to be close up to the cylinder, it is possible to bring the cylinder pressure down to that of the condenser. Critics of Prof. Stumpf's engine will require proof of the claim as to the "excellent thermal action of this engine," a proof which is provided in the volume under review by several indicator diagrams, which show the expansion line to be an adiabatic for saturated steam, and the compression line to be an adiabatic for superheated steam. As the writer points out, "the excessive initial condensation, in an ordinary counterflow engine using saturated steam, causes the expansion line to follow approximately the law of Mariotte. In the Una-flow engine, using saturated steam, there is practically no initial condensation, so that the resulting expansion line is necessarily an adiabatic, and all the more so if the steam is superheated." As regards the latter point, it is said to be possible, and there appears to be no reason to doubt the statement, without making any modification in the uni-flow system of construction to work with superheats far in excess of those usually employed at present. The new construction would appear to open up a further field of development by enabling

higher temperatures to be used, as the superheat is favourable for the entire cycle. In the ordinary counter-flow engine with multi-stage expansion, however, the superheat is usually excessive in the first cylinder and not sufficient in the succeeding cylinders. The book is profusely illustrated with Una-flow engines of very varied types, including stationary engines, locomotives, portable engines, rolling mill and winding engines, as well as engines for driving compressors, blowers, pumps, stamps and presses, the last chapter being devoted to the Una-flow marine engine. The uni-flow system would seem to be particularly adapted to meet the recent tendency in marine practice to introduce superheating and to employ balanced lift valves for distributing the steam. Though the majority of the engines described are employed on the Continent, an interesting account is given of a 500-H.P. Una-flow rolling-mill engine, built by Messrs. Musgrave & Sons, Ltd., of Bolton. —G. S. S.

MECHANICAL STOKERS AND THEIR EFFECT ON THE COAL MARKET.

By HAROLD C. WRIGHT.

The wonderful strides made by the various types of automatic stokers during the last 10 to 12 years, combined with the rapid expansion of electrical works run by steam power, have had a very noticeable effect in the coal trade. Perhaps less than 12 years ago the majority of works driven by steam power used large or unscreened steam coal of the smokeless or semi-bituminous variety in hand-fired boilers. Now there are very few works of importance which are not fitted with mechanical stokers.

The chief deterrent to the use of bituminous or semi-bituminous small coals was the question of smoke, especially in the centres of the big towns. The advent of automatic stokers, with their various contrivances for the consumption, or practically total consumption, of smoke, has overcome this difficulty. The result is somewhat startling. Small coal, *i.e.*, the screenings obtained after the large coal, cobbles and nuts have been passed over 1-in. or 2-in. screens, ten years ago was almost a drug in the market, and could be purchased at about 1s. to 2s. per ton at pit. Smaller qualities still would be willingly given away if contractors would pay the wagon hire and railway carriage, or, in any case, a charge of a few pence only was made according to the demand for brick or ballast burning. At the present time rough smalls, *i.e.*, the 1-in. to 2-in. variety, fetch 6s. to 6s. 6d. at pit, and the smaller variety about 3s. to 3s. 9d. The chief cause of this is the increasing use of mechanical stokers, and the demand for the better descriptions of sized small coals, *i.e.*, peas, single, double and treble nuts, is becoming so great, that within the last ten years screening and washing plants (and in some cases coal-crushing plants) have been installed at the principal collieries in Great Britain.

An approximate list of the prices at collieries from 1907 to date, is as follows :—

	Fine slack.	Rough or nut slack.	Peas.	D.S. nuts.
1907... ...	3d. to 6d.	1/9 to 2/6	3/3 to 4/-	4/- to 4/6
1908... ...	1/- „ 1/6	2/6 „ 3/-	3/6 „ 4/3	4/6 „ 5/-
1909... ...	1/3 „ 2/-	2/9 „ 3/6	3/9 „ 4/6	4/6 „ 5/3
1910... ...	2/- „ 2/6	3/3 „ 3/9	4/- „ 4/9	4/9 „ 5/6
1911... ...	2/6 „ 3/3	3/9 „ 5/-	5/3 „ 6/-	6/- „ 6/9
1912... ...	3/- „ 3/9	5/6 „ 6/6	6/9 „ 7/9	7/6 „ 8/6

The average *contract* price is given, and no consideration is given to figures that were obtained through the threats of, and actual occurrence of, coal and lighterage strikes.

It will be seen from the prices mentioned, that in most cases the price has doubled, and in others it has advanced in greater proportion. This advance is not all accounted for by the demand for coal for mechanical stokers, as legislation increasing the cost of working and transporting the coal is responsible for a considerable portion, but without doubt the question of demand and supply is one of the chief reasons.

What will be the outcome of this? Will small coals soon be as dear as the large? In that case will the works revert to the old style of stoking, or will it be necessary for the collieries or consumers to install coal-crushing plants in order to meet the demand for sized small coals?

The erection of crushing plants would not add much to the actual cost of the coal, but when finally sold, it would be more costly than the ordinary types. It must be borne in mind, however, that broken small would give better calorific results. It would all be pure coal, while ordinary smalls contain the natural run of the mine.

There is not the slightest doubt that users of mechanical stokers have hitherto obtained better results in evaporation, owing more or less to the perfect combustion of coal. They have also effected economies with regard to price and quantity of fuel used; but if the demand for small coal increases, the price will soon be as high as that of large screened coal and the economical results that have been obtained by the use of mechanical stokers will be unattainable.

As an example, it may be interesting to note the costs of average contract coal at one of the largest generating stations in London :—

1909-10	...	11s. 0d. for single nuts alongside wharf.
1910-11	...	11s. 4d. „ „ „ „
1911-12	...	13s. 0d. „ „ „ „
1912-13	...	16s. 6d. „ „ „ „

In the case of the period 1911-12 purchases had to be made outside contract, and the mean price would be nearer 13s. 3d. than the figure quoted.

With regard to the period 1912-13, it might be noted that an excellent Welsh through-and-through coal could be obtained for certainly not more than the nuts have been purchased at, and, assuming that the fires were hand-fed, the results given would be all round in favour of the Welsh through-and-through.

TRADE STATISTICS OF CANADA.

The following figures, showing the imports into and exports from Canada of electrical and similar materials during the year ended March 31st, 1912, are taken from the recently issued trade statistics. Figures for the year 1910-11 are given for purposes of comparison, and notes of any increases or decreases have been added :—

	1910-11. Dollars.	1911-12. Dollars.	Increase or decrease. Dollars.
Brass wire, plain.—			
From United Kingdom ...	5,000	7,000	+ 2,000
„ United States ...	37,000	31,000	— 6,000
Total ...	42,000	38,000	— 4,000
Railway passenger cars.—			
From United States ...	57,000	208,000	+ 151,000
Tram or horse cars.—			
From United States ...	5,000	5,000	—
Celluloid manufactures.—			
From United Kingdom ...	9,000	8,000	— 1,000
„ Germany	2,000	5,000	+ 3,000
„ United States ...	42,000	43,000	+ 1,000
„ Other countries ...	6,000	7,000	+ 1,000
Total ...	59,000	63,000	+ 4,000
Coal, bituminous.—			
From United Kingdom ...	20,000	13,000	— 7,000
„ United States ...	14,576,000	18,199,000	+ 3,623,000
Total ...	14,596,000	18,212,000	+ 3,616,000
Copper wire, plain, tinned or plated.—			
From United Kingdom ...	1,000	4,000	+ 3,000
„ United States ...	64,000	72,000	+ 8,000
Total ...	65,000	76,000	+ 11,000
Electric light carbons and carbon points.—			
From United Kingdom ...	8,000	8,000	—
„ Germany	14,000	17,000	+ 3,000
„ United States ...	37,000	29,000	— 8,000
„ Other countries ...	2,000	2,000	—
Total ...	61,000	56,000	— 5,000

	1910-11. Dollars.	1911-12. Dollars.	Increase or decrease. Dollars.
Electric apparatus not mentioned—insulators, electric and galvanic batteries, telegraph and telephone instruments.—			
From United Kingdom ...	360,000	544,000	+ 184,000
„ Austria	5,000	6,000	+ 1,000
„ France	7,000	8,000	+ 1,000
„ Germany	45,000	29,000	— 16,000
„ Sweden	26,000	65,000	+ 39,000
„ United States ...	3,751,000	3,975,000	+ 224,000
„ Switzerland ...	22,000	2,000	— 20,000
„ Other countries ...	2,000	6,000	+ 4,000
Total ...	4,218,000	4,635,000	+ 417,000
Incandescent lamp bulbs, &c.—			
From Austria	15,000	17,000	+ 2,000
„ United States ...	75,000	99,000	+ 24,000
„ Other countries ...	5,000	5,000	—
Total ...	95,000	121,000	+ 26,000
Electric motors, generators, dynamos and sockets.—			
From United Kingdom ...	24,000	76,000	+ 52,000
„ France	2,000	2,000	—
„ Sweden	13,000	30,000	+ 17,000
„ United States ...	518,000	871,000	+ 353,000
„ Other countries ...	1,000	4,000	+ 3,000
Total ...	558,000	983,000	+ 425,000
Lamp chimneys, glass shades and globes.—			
From United Kingdom ...	3,000	4,000	+ 1,000
„ Austria	13,000	13,000	—
„ Germany	19,000	30,000	+ 11,000
„ United States ...	245,000	275,000	+ 30,000
„ Other countries ...	2,000	1,000	— 1,000
Total ...	282,000	323,000	+ 41,000
Rubber belting.—			
From United Kingdom ...	29,000	36,000	+ 7,000
„ United States ...	34,000	47,000	+ 13,000
Total ...	63,000	83,000	+ 20,000
Manufactures of india-rubber and gutta-percha, except clothing and similar goods.—			
From United Kingdom ...	143,000	155,000	+ 12,000
„ Austria	3,000	8,000	+ 5,000
„ France	5,000	4,000	— 1,000
„ Germany	44,000	48,000	+ 4,000
„ United States ...	568,000	645,000	+ 77,000
„ Other countries ...	4,000	1,000	— 3,000
Total ...	767,000	861,000	+ 94,000
Locomotives for railways.—			
From United Kingdom ...	2,000	8,000	+ 6,000
„ United States ...	295,000	407,000	+ 112,000
Total ...	297,000	415,000	+ 118,000
Gasoline engines.—			
From United Kingdom ...	126,000	189,000	+ 63,000
„ United States ...	1,322,000	1,935,000	+ 613,000
„ Other countries ...	17,000	15,000	— 2,000
Total ...	1,465,000	2,139,000	+ 674,000
Steam engines.—			
From United Kingdom ...	43,000	47,000	+ 4,000
„ United States ...	202,000	230,000	+ 28,000
Total ...	245,000	277,000	+ 32,000
Boilers, steam.—			
From United Kingdom ...	52,000	74,000	+ 22,000
„ United States ...	128,000	162,000	+ 34,000
„ Other countries ...	1,000	—	— 1,000
Total ...	181,000	236,000	+ 55,000
All machinery not mentioned, except sewing machines, textile machinery, printing machinery, &c.—			
From United Kingdom ...	1,241,000	1,713,000	+ 472,000
„ France	27,000	6,000	— 21,000
„ Germany	220,000	203,000	— 17,000
„ United States ...	10,976,000	13,331,000	+2,355,000
„ Other countries ...	93,000	111,000	+ 18,000
Total ...	12,557,000	15,364,000	+2,807,000
Iron and steel wire, single or several, covered with cotton, linen, silk, rubber, or other material, including cables so covered.—			
From United Kingdom ...	201,000	229,000	+ 28,000
„ United States ...	286,000	426,000	+ 140,000
„ Other countries ...	9,000	8,000	— 1,000
Total ...	496,000	663,000	+ 167,000
Iron and steel wire not mentioned (except fencing wire).—			
From United Kingdom ...	52,000	13,000	— 39,000
„ Germany	18,000	49,000	+ 31,000
„ United States ...	197,000	218,000	+ 21,000
„ Other countries ...	4,000	8,000	+ 4,000
Total ...	271,000	288,000	+ 17,000
Lighting fixtures of metal, including electric light fixtures of metal.—			
From United Kingdom ...	24,000	34,000	+ 10,000
„ Austria	2,000	3,000	+ 1,000
„ United States ...	470,000	562,000	+ 92,000
„ Other countries ...	11,000	10,000	— 1,000
Total ...	507,000	609,000	+ 102,000
Asbestos manufactures.—			
From United Kingdom ...	33,000	43,000	+ 10,000
„ United States ...	212,000	298,000	+ 86,000
„ Other countries ...	9,000	9,000	—
Total ...	254,000	350,000	+ 96,000
Plumbago, ground and manufactured.—			
From United Kingdom ...	4,000	4,000	—
„ United States ...	39,000	35,000	— 4,000
Total ...	43,000	39,000	— 4,000
EXPORTS.			
Mica.—			
To United Kingdom ...	61,000	40,000	— 21,000
„ United States	247,000	218,000	— 29,000
„ Other countries ...	2,000	—	— 2,000
Total ...	310,000	258,000	— 52,000
Electrical apparatus.—			
To United Kingdom ...	9,000	16,000	+ 7,000
„ Newfoundland ...	3,000	5,000	+ 2,000
„ United States	110,000	110,000	—
„ Other countries ...	10,000	7,000	— 3,000
Total ...	132,000	138,000	+ 6,000
Machinery.—			
To United Kingdom ...	78,000	70,000	— 8,000
„ Newfoundland ...	19,000	35,000	+ 16,000
„ New Zealand	3,000	3,000	—
„ Argentina	8,000	33,000	+ 25,000
„ France	4,000	10,000	+ 6,000
„ United States	570,000	461,000	— 109,000
„ Other countries ...	65,000	75,000	+ 10,000
Total ...	747,000	687,000	— 60,000

The Electric Furnace for Cement Making.—One of the worst difficulties in the manufacture of cement in an electric furnace has been the formation of carbide of calcium, which has combined with the cement and spoilt it. It is now reported that a Swedish engineer, Mr. A. R. Lindblad, has discovered how to prevent this. The invention is patented, and consists briefly in adding to the charge a certain quantity of a metallic oxide which is capable of reducing the carbide of calcium. Oxide of iron is mentioned as a suitable compound, and it can be added to the products at the tapping in pulverised form instead of being added to the charge.

Book Notices.—"The University of Liverpool Engineering Society *Journal*" for December (Vol. I, No. 2; the University Press, Price 1s. 6d.) contains a description of the new Harrison-Hughes Laboratories, which have been specially equipped for work relating to the utilisation of fuel for power purposes, particularly in connection with internal-combustion engines and gas producers, at a cost of £40,000. There are also articles on "Ball Bearings," by G. W. Goodchild; "The Electric Drive," by E. Swinton; "The Law Affecting the Engineer," by E. J. Rimmer; and "The Specific Heat of Gases," by G. E. Scholes.

"*Journal* of the American Society of Mechanical Engineers." December, 1912. New York: The Society. Price 35 cents.

"*Transactions* of the University of Toronto Engineering Society." November, 1912. Toronto: The Society.

"*Bulletin* of the Massachusetts Institute of Technology." Vol. XLVIII, No. 1. December, 1912. Boston: The Institute.

NEW PATENTS APPLIED FOR, 1912.

(NOT YET PUBLISHED.)

Compiled expressly for this ournal by Messrs. W. P. T[illegible] & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

28,316. "Electricity meters." S. H. Holden and Chamberlain & Hookham, Ltd. December 9th.

28,327. "Automatic device for limiting [illegible]g the speed of vehicles propelled by internal combustion engines [illegible]ctricity." C. Robinson. December 9th.

28,332. "Electric heating device." P. Good and W. Alldis. December 9th.

28,349. "Electric automatic or hand-operated indicator or signal, combining advertisement display, to be used in public placed buildings, vehicles, or sea and river-going vessels." A. G. Grundel. December 9th.

28,358. "Ships' telegraphs or the like." T. L. Knight. December 9th.

28,359. "Apparatus for heating liquids by electricity" J. Von Hentzel. December 9th. (Complete.)

28,409. "Means for controlling electrical devices." A. C. Hulbert. December 9th. (Complete.)

28,412. "Ignition plugs for internal-combustion engines." A. Ruprecht. (Convention date, December 11th, 1912, Germany.) December 9th. (Complete.)

28,437. "Shade supports for electric incandescent lamps." J. N. Mollett. December 10th.

28,469. "Magneto-electric machinery." R. C. Staunton. December 10th.

28,470. "Electrical sign mechanism." E. O. Brown. December 10th.

28,483. "Safety device for electric machines." Siemens-Schuckertwerke G.m.b.H. (Convention date, December 11th, 1911, Germany.) December 10th. (Complete.)

28,486. "Selective signalling apparatus for telephone or telegraph instruments." H. E. R. Roose and W. T. Finlay. December 10th. (Complete.)

28,503. "Electric arc lights." General Composing Co., G.m.b.H. (Convention date, December 11th, 1911, Germany.) December 10th. (Complete.)

28,513. "Electric ignition." F. G. L. Biddlecombe and G. Thomas. December 10th.

28,518. "Process for preventing the development of chlorine gas in such cases where sea water penetrates into the interior of electric boats and the like." H. Wehrlin. (Convention date, March 25th, 1912, Germany.) December 10th. (Complete.)

28,519. "Process and device for the protection of electric accumulators when over-flooded by sea water." H. Wehrlin. (Convention date, March 25th, 1912, Germany.) December 10th. (Complete.)

28,520. "Process and device for the protection of electric accumulators when over-flooded by sea water." H. Wehrlin. (Convention date, March 25th, 1912, Germany.) December 10th. (Complete.)

28,523. "Thermo-galvanometers, electric current detector, radio-meters, and the like." F. W. Jordon, T. E. Gambrell and C. T. Gambrell. December 10th.

28,538. "Fittings of metallic conduits for electrical conductors." Simplex Conduits, Ltd., and L. M. Waterhouse. December 11th.

28,542. "Electrical heating apparatus." E. G. Byng and J. H. Collings. (Divided Application on No. 6,768, 1912, March 19th.) December 11th.

28,565. "Electric lamp lock." J. Bailey. December 11th.

28,595. "Appliances for producing electric oscillations." R. Krause. Convention date, December 20th, 1911, Germany.) December 11th. Complete.)

28,605. "Control gear for electrical and other machinery." G. H. Rae and Cunard Steamship Co., Ltd. December 11th.

28,619. "Limit-switches for use in or with machinery driven by electric motors." W. A. Heywood. December 12th.

28,624. "Electric arc carbon for use in cinematograph apparatus." G. Rathbone. December 12th.

28,627. "Non-shunt electric arc lamps." W. Rogers and G. Rowe. December 12th. (Complete.)

28,634. "Electric current regulating and controlling apparatus, such as electric motor starting and controlling apparatus and the like." J. A. Hirst and P. S. Brook. December 12th.

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28,636. "Switches for tramways and the like." R. Cumming. December 12th.

28,639. "Thermo-electric generators." P. Ferra. December 12th.

28,645. "Electrode for diathermic treatment of the interior cavities of the human body." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) December 12th. (Complete.)

28,646. "Watertight insulating plug for submersible vessels." Siemens Bros. & Co., Ltd., and W. D. Le Corney. December 12th. (Complete.)

28,648. "Electric time-keeping apparatus." F. T. Reid and C. Wiener. December 12th.

28,665. "Electrically-operated pulley block." W. E. Evans. (Deutsche Maschinenfabrik Akt.-Ges., Germany.) December 12th. (Complete.)

28,677. "X-ray or like photographic apparatus." H. F. Bigge and F. R. Butt. December 12th. (Complete.)

28,724. "Holders for readily interchangeable electrical apparatus such as glow lamps, fuses and the like." Siemens-Schuckertwerke G.m.b.H. (Convention date, July 24th, 1912, Germany.) December 13th. (Complete.)

28,728. "Electric imitation candle lamps." Candolite Co. and P. J. Weiss. December 13th.

28,740. "Dynamo-electric machines." J. H. Gath. December 13th.

28,748. "Machines for generating electric current for dual purposes such as ignition and illumination." F. L. Hollister. December 13th.

28,751. "Telephone installation in which the subscribers' connections are grouped according to the number of calls." Siemens & Halske Akt.-Ges. (Convention date, December 19th, 1911, Germany.) December 13th. (Complete.)

28,772. "Electric miners' lamp." P. Rosenberg. December 13th.

28,779. "Method of transmitting electric current from external sources to the motors of electrically-propelled vehicles." S. M. Searle and J. H. Wilkins. December 14th.

28,793. "Electrical temperature-regulating apparatus." W. E. Gray and W. Best. December 14th.

28,808. "Electric switches." H. G. Robertson. December 14th.

28,809. "Unspillable electric accumulator cells." W. Thomson. December 14th.

28,816. "Electric lamps for mines." H. Joris. December 14th.

28,824. "Electromagnetic relays." Siemens Bros. & Co., Ltd., and W. H. Grinsted. (Divided application on No. 14,564, June 21st, 1912.) December 14th. (Complete.)

28,831. "Means for regulating generator strengths and pressures." E. Eisemann & Co. G.m.b.H. and E. Eisemann. December 14th.

28,841. "Electrical apparatus for telegraphing, signalling and controlling of torpedoes and the like purposes." J. F. Meissner and V. Krasnikoff. December 14th.

28,846. "Electrically-heated garments." A. C. Stubling. December 14th. (Complete.)

28,862. "Relay apparatus particularly intended for use in connection with telephonic and telegraphic systems." S. G. Brown. December 14th.

28,864. "Electromagnets and the like." Soc. Anon. des Etablissements L. Blériot. (Convention date, December 15th, 1911, France.) December 14th. (Complete.)

28,865. "Wireless telegraph transmitters." G. Marconi. December 14th.

28,866. "Wireless telegraph transmitters." G. Marconi. December 14th.

PUBLISHED SPECIFICATIONS.

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1911.

Electric Switches for use more particularly in Voltage Regulating Systems. British Thomson-Houston Co. and E. Garton. 26,119. November 22nd.

Means for Intermittently Indicating or Displaying the Names of Stations or Stopping Places in Trains or other Vehicles or other Situations or other Devices, or Matter in such Vehicles or other Situations. C. J. Evans and J. McI. Cater. 26,450. November 25th. (Cognate application, 4,272 of 1912.)

Switch Apparatus for Use in Connection with the Electric Lighting and Heating Equipments of Railway and other Vehicles. Electric and Ordnance Accessories Co. and J. Etchells. 27,010. December 2nd.

Electric Firing Appliances for Small Arms. Soc. Peuble et Durif, and G. Peuble. 27,121. December 4th.

Electrical Time Switches. W. Hamilton and Ferranti, Ltd. 21,610. December 19th. (Addition to 13,704 of 1910.)

1912.

Means for the Manufacture of Bushes or Bearings for Shafts, Axles, Self-Propelled Vehicles, Engines, Electric Motors, or the Like. W. G. Hanna. 1,698. January 22nd.

Blackleading Machines for the Use of Electrotypers. R. Hoe & Co. and F. G. Lougee. 1,969. January 24th.

Lamp Supports and Casings Particularly Designed for Use with Electric Incandescent Lamps. J. S. Highfield. 3,746. February 14th. (Addition to 27,991 of 1908.)

Controlling Continuous Current Reversible Dynamo-Electric Machines. G. Inrig and L. Inrig. 4,119. February 19th.

Brush or the Like for the Medicinal Application of Electricity. H. Weiss. 4,382. February 21st.

Bath for the Electrolysis of Iron. G. Tischenko. 5,853. March 8th.

Electric Heating Devices. Ferranti, Ltd., and J. Roothaan. 6,182. March 12th.

Construction of Tramcars. R. S. Pilcher. 6,643. March 18th.

Telephone Relays or Repeaters. F. A. Stirrup. 8,798. April 13th.

Galvanometers. C. Hubert. 9,410. April 20th.

Means for Indicating Faults in the Circuits of Electrical Transmission Systems. Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges.) 13,864. June 18th.

Refillable Cartridge-Fuses for Electrical Purposes. E. B. Mallory. 14,109. (June 17th, 1911.) June 17th.

Electrical Resistance Devices. E. Ruhstrat. 15,053. (December 18th, 1911.) June 27th.

Processes and Apparatus for Electric Welding. L. W. Chubb. 15,479. (February 16th, 1912.) July 2nd.

Roentgen Ray Examination Table for Gynecological and Like Purposes. Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges.) 15,750. July 5th.

Electric Arc Lights. General Composing Co. Ges. m.b.H. 15,757. (July 15th, 1912.) July 5th.

Telephones. H. Sefton-Jones. (Akt.-Ges. Mix & Genest Telephon und Telegraphenwerke.) 18,437. August 6th.

Electrical Regulating Apparatus. W. E. Lake. (J. B. M. Electric Co.) 18,437. August 10th.

Telephone Systems. Western Electric Co., Ltd. (Telephon Apparat Fabrik E. Zwietusch & Co., Ges.) 20,947. (Divided application, 21,260, 1911. September 26th.) September 18th.

Cooling of Dynamo-Electric Machines. Siemens Bros. Dynamo Works, Ltd., and W. Marden. 21,472. September 20th.

U.S.A.—All of the large generating companies on the Canadian side of Niagara Falls are at present engaged in building extensions to their systems with a view to utilising all the water available for power purposes under the existing treaty. The Toronto Power Co. has a number of new units already in place, and early next year will complete its station, which will have equipment aggregating 125,000 H.P. A new line fitted with pin insulators, and operated at 85,000 volts, will also be in operation between Niagara Falls and Toronto. The Canadian Niagara Power Co. is completing its station building, and installing additional units. It will expend $1,250,000 in the next two years in enlarging the forebay, so as to be able to get enough water to generate all the electricity that it can dispose of under the treaty. The station of the Ontario Power Co. has been doubled in size, and will shortly be completed. With the installation of two 12,000-KW. units now on order the company will be using almost all of the water granted to it by the Dominion Government. The stations on the American side of Niagara Falls are now using all the water allotted to them by the Secretary of War, and while the granting of additional water up to the amount at the disposal of the United States under the treaty is optional with the Secretary of War, there does not appear to be any inclination on the part of the Washington officials to release any of this water for power purposes. For the present, therefore, and probably for some time to come, the stations on the American side have reached their maximum development, and no further development will be possible on either side of the Falls after 1915, for by that time all the available water will be used.—*Electrical World.*

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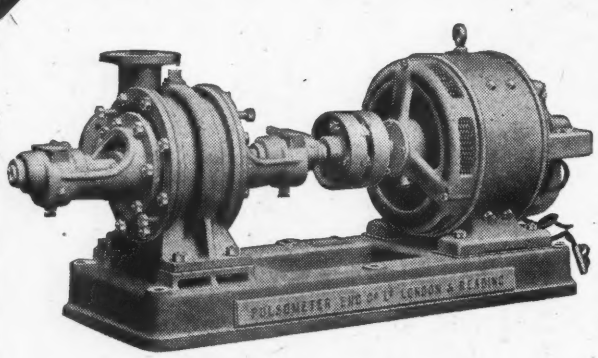

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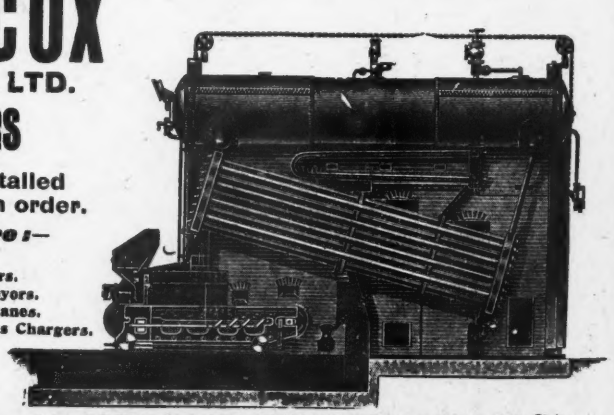

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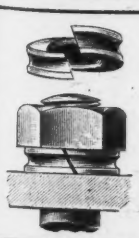

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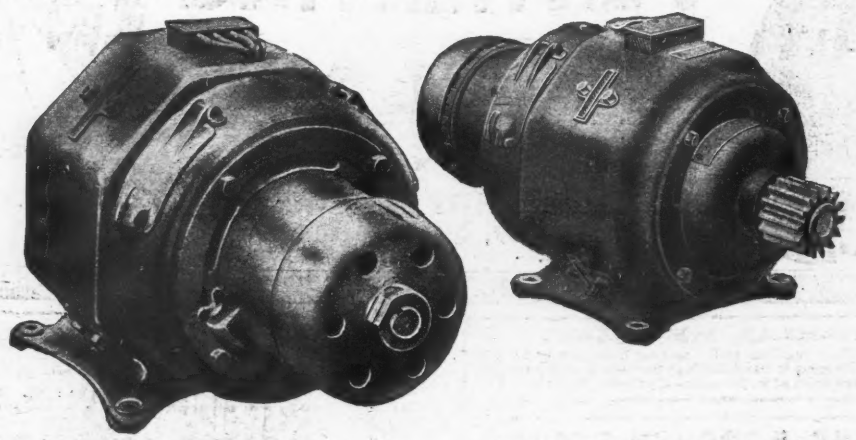

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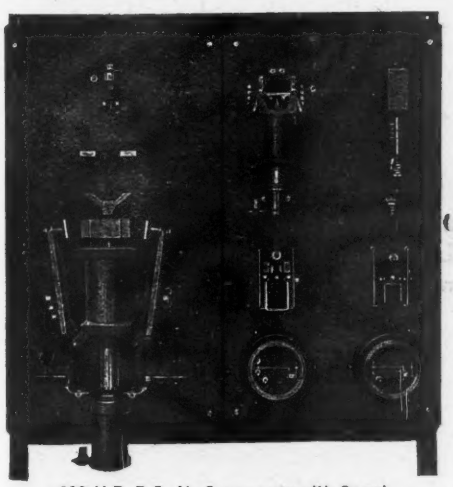

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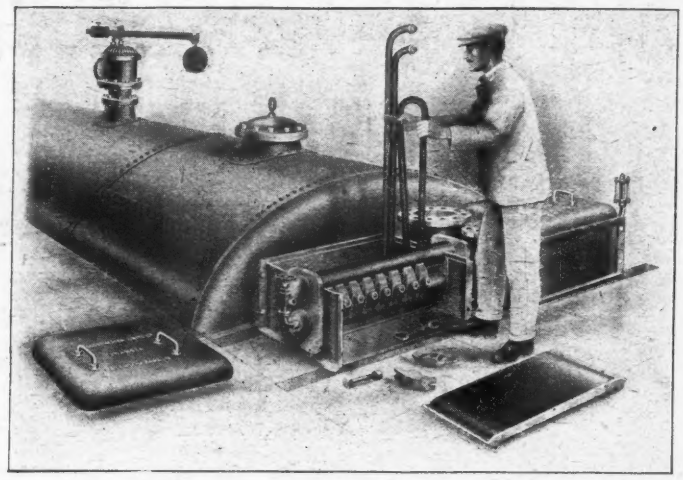

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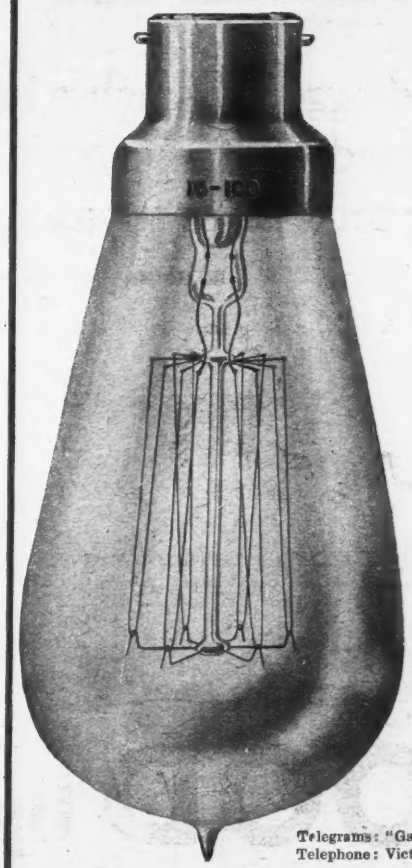

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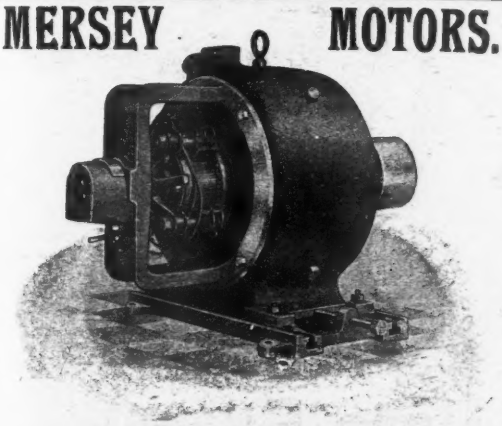

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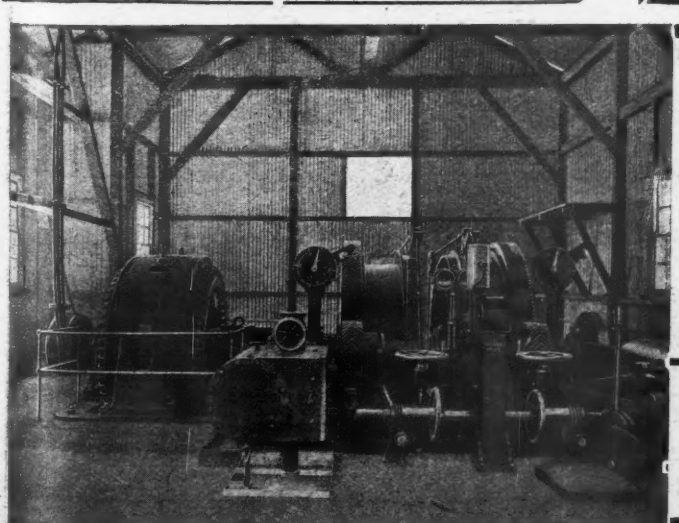

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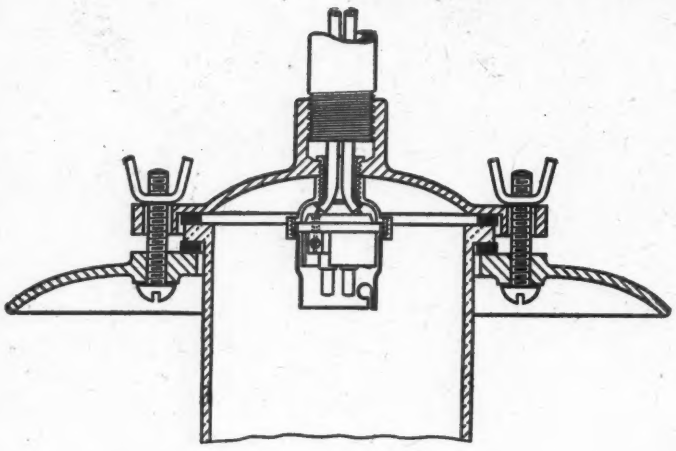

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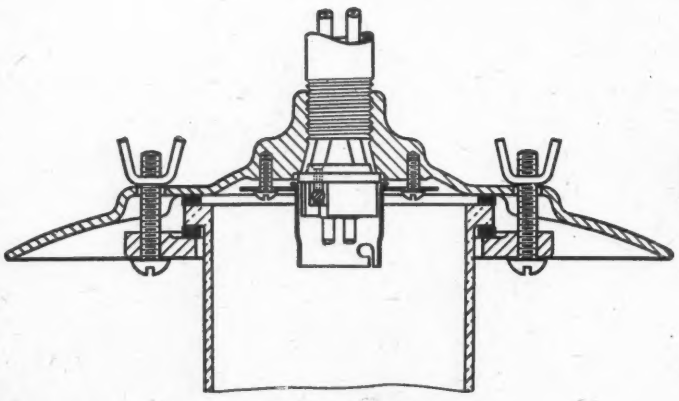

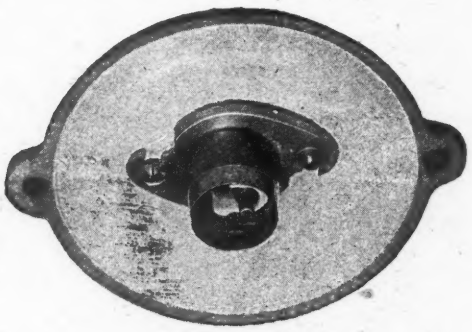

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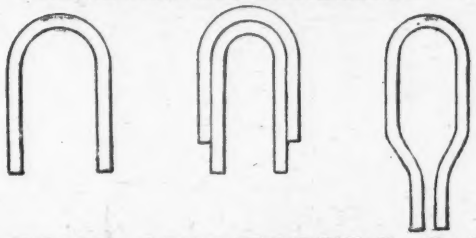

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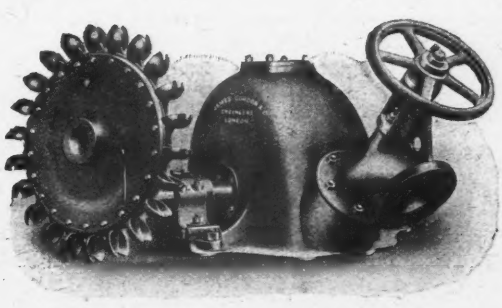

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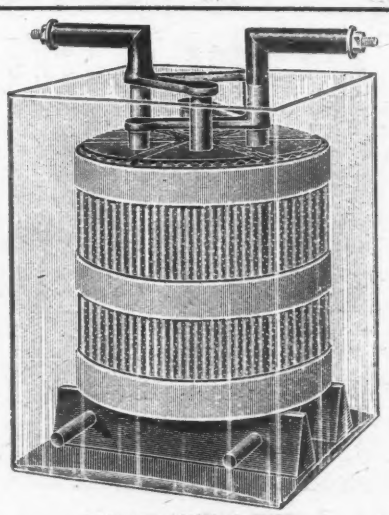

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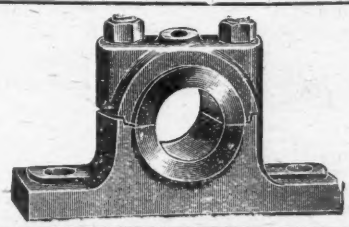

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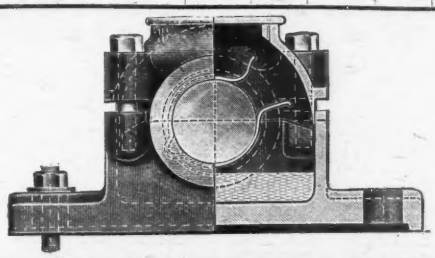

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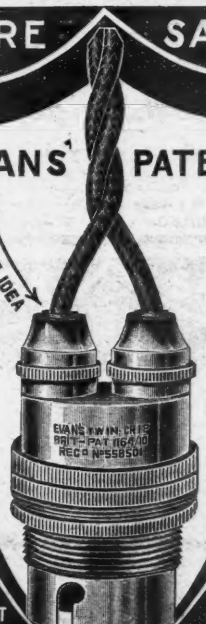

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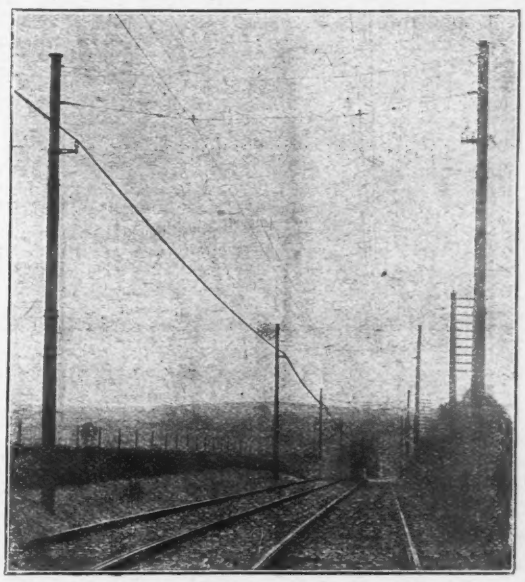

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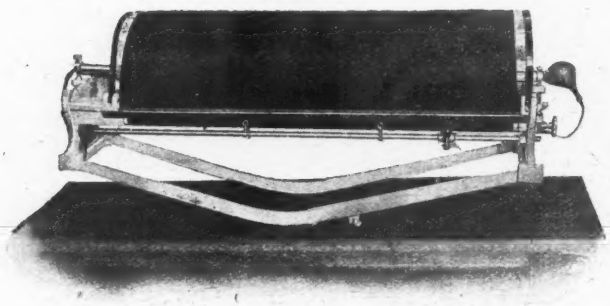

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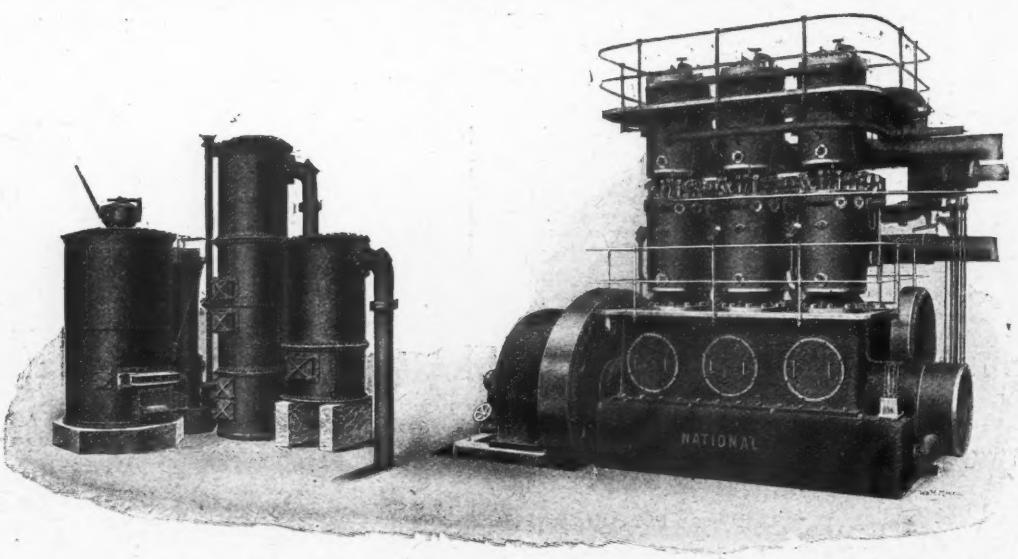

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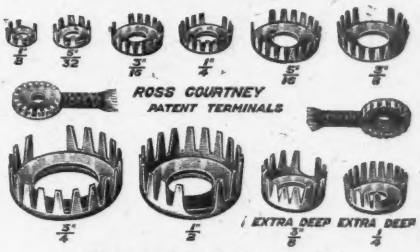

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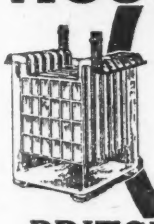

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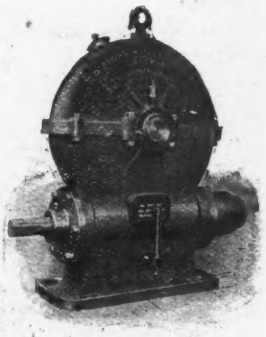

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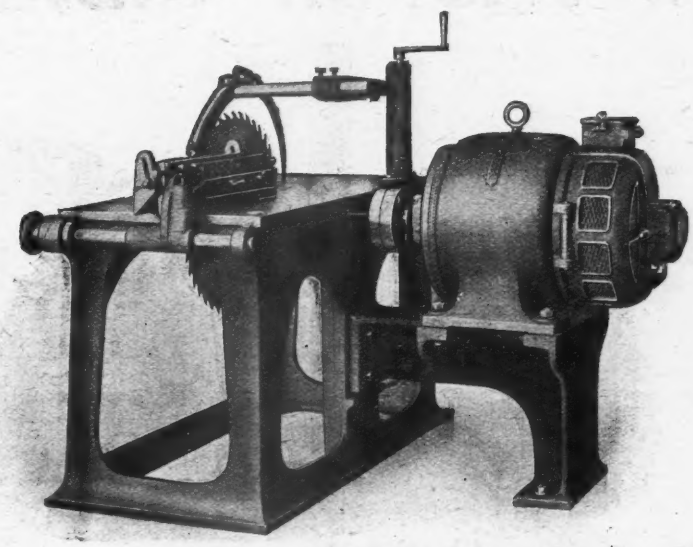

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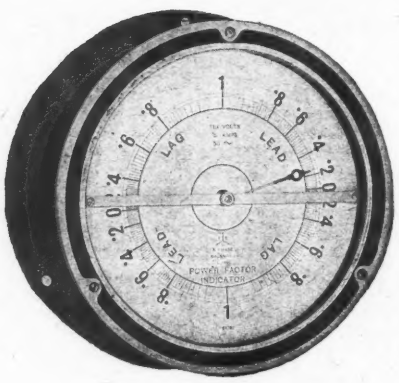

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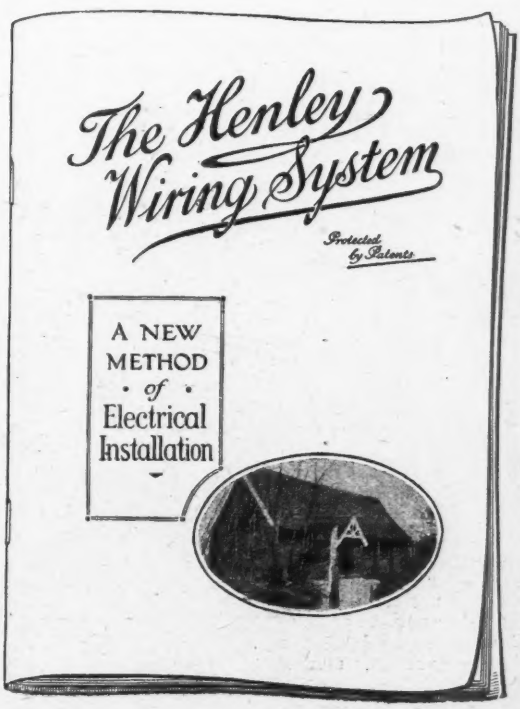

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BELFAST—Faraday House, Queen Street (Mr. J. Bow Tannahill); **BRISTOL**—6, Bristol Bridge (Mr. W. H. R. Cleave); **CARDIFF**—Dragon Buildings, Paradise Place (Mr. H. Nance); **DUBLIN**—Norwich Union Chambers, Dawson Street (Mr. D. J. Doolan); **LEEDS**—11, Upper Mill Hill, Boar Lane (Messrs. Casperson Bros.); **MIDDLESBROUGH**—392, Linthorpe Road (Messrs. J. T. Bell & Co.) **NEWCASTLE-ON-TYNE**—25, Pilgrim Street (Mr. B. T. Dale); **SHEFFIELD**—74, High Street (Mr. Wm. Molesworth).

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CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDEEN.—Conversion of houses in Stevenson Street into business premises, for the Northern Loan Co., Ltd.; G. B. Mitchell, architect, 148, Union Street, Aberdeen. Conversion of building at junction of Great Northern Road and Smithfield Lane into cinematograph theatre, for J. Clark, ironmonger, Peterhead.

ABERYSTWYTH.—Proposed new agricultural buildings in connection with University College (£20,000); Ald. D. C. Roberts, Senior Treasurer to the Council, Aberystwyth.

ACCRINGTON.—Proposed rescue station; Secretary, Lancashire and Cheshire Coalowners' Association.

AIRDRIE.—Proposed extension of county buildings; J. Rennie, County Surveyor, Sandyhills, Shettleston, Glasgow. Contemplated further fever hospital accommodation (£12,000); H. Inglis, Burgh Surveyor.

ALTRINCHAM.—Hospital; F. B. Dunkerley, architect, 17, St. Anne's Square, Manchester.

ASHTON-UNDER-LYNE.—Proposed hall in connection with the parish church; Rev. F. R. C. Hutton, Rector.

AYR.—Refrigerating factory and plant (£4,000); F. St. Clair Williams, architect, Sandgate Street, Ayr.

BACUP.—New shops for Bacup Co-operative Society, Rochdale Road (£3,000); H. Cropper, architect, St. James Street, Bacup.

BARNSTAPLE.—Swimming baths (£3,000); E. Y. Saunders, Surveyor, Town Hall, Barnstaple.

BECCLES.—Probable re-erection (after fire) of premises, for Crisp & Sons, maltsters (damage £20,000).

BENFIELDSIDE.—Picture hall (£3,000); J. Eltringham, architect, Derwent Street, Blackhill, Co. Durham.

BINGLEY (near KEIGHLEY).—Proposed extension of Sunday school premises, in connection with the Primitive Methodist Church; Rev. W. J. Robson, Circuit Minister.

BIRMINGHAM.—Contemplated new school at Erdington; J. A. Palmer, Secretary to the Education Committee, Education Offices, Edmund Street. School, Willow Avenue; H. J. Buckland, architect, Norwich Chambers, Congreve Street, Birmingham. Theatre, Soho Hill; T. Silver, architect, 120, Soho Hill, Birmingham. Theatre at Erdington; A. Hamblin, architect, 115, Colmore Row, Birmingham. Bottling stores, Cope Hill; W. H. Gibbs, builder, King's Heath, Birmingham.

BLACKPOOL.—Contemplated extensions at the Victoria Hospital, for the Board of Management. Wesleyan Sunday Schools (£2,750); Potts, Son & Hennings, architects, Victoria Street, Manchester.

BLACKWOOD.—Hall; H. & D. Barclay, architects, 245, St. Vincent Street, Glasgow.

BOLTON.—Proposed new school and workshops for the blind, off Marsden Road; H. Sissons, Court Chambers, Mawdsley Street, Bolton. Central hall, for Lancs. Miners' Federation (£6,000); Bradshaw and Gass, architects, 19, Silverwell Street, Bolton.

BOOTLE (near LIVERPOOL).—Alterations and additions to Territorial headquarters, Park Street; H. L. Beckwith, architect, Bank Chambers, 3, Cook Street, Liverpool.

BOVEY TRACEY.—Sanatorium, Hawkmoor Estate; E. H. Harbottle, architect, County Chambers, Exeter.

BRIGHTON.—Proposed alterations to old workhouse and new infirmaries (£1,710); B. Burfield, Clerk, Guardians' Offices, Brighton.

BRITON FERRY.—New school at Cwrt Sart; W. E. R. Allen, Deputy Clerk to the Glamorgan C.C., County Hall, Cathays Park, Cardiff.

BROADWAY.—Alterations and additions to Childswickham Schools, for Gloucestershire C.C.; R. S. Phillips, architect, Shire Hall, Gloucester.

BURNLEY.—Schools, Padiham Lane (£8,000), and Burnley Lane (£8,000); H. Littler, County Architect, 16, Ribblesdale Place, Preston.

BURSLEM.—Re-erection (after fire) of portion of works at Midland Tileries, Longport, for Boulton & Co. (damage over £1,000).

BURY.—Probable re-erection (after fire) of portion of Hudcar Mills, Freetown, for the Bury Felt Manufacturing Co. (damage £5,000).

BUXTON.—Rebuilding St. Mary's Church; Vicar.

CARDIFF.—Rebuilding premises, Queen Street Arcade, for Messrs. Lewis, house furnishers.

CHARD.—Isolation Hospital; C. O. Baines, Surveyor, U.D.C. Offices, Paignton.

CHESTER.—Proposed housing scheme (£8,000); W. M. Jones, City Surveyor.

CHESTERFIELD.—Extensions to Holy Trinity Church, Stonegravels; Vicar.

CLITHEROE.—Proposed church institute at Chatburn; Vicar of Chatburn.

CLYDEBANK.—Alterations to premises, Dumbarton Road, for the Clydebank and District Water Trust.

COLCHESTER.—Proposed baths (£8,000); H. Goodyear, Surveyor, Town Hall, Colchester.

COLWYN BAY—Additions to Royal Hotel, for Worthington & Co., Ltd., brewers, Burton-on-Trent.

COTTINGHAM (near HULL).—Alterations and additions to schools for the East Riding of Yorks C.C.; Building Surveyor, County Hall, Beverley.

CROYDON.—Thirty-two houses, Bingham Road, Addiscombe; A. C. F. Ducket, 18, Addiscombe Avenue, Croydon.

DALTON (near HUDDERSFIELD).—New Wesleyan church and Sunday schools.

DENNY.—Proposed library; A. G. Merriles, Surveyor, Town Hall, Denny.

DENTON (near MANCHESTER).—Proposed rescue station depôt; Secretary, Lancashire and Cheshire Coalowners' Association, Manchester.

DEVONPORT.—Municipal buildings (£70,000); J. F. Burns, Surveyor, Town Hall, Devonport.

DONCASTER.—Proposed new club premises at Carcroft; Secretary, W.M. Institute, Carcroft, near Doncaster.

DOUGLAS (ISLE OF MAN).—Picture theatre, Walpole Avenue, for H. B. Mylchreest; J. H. Cowle, architect, Douglas.

DUBLIN.—Hall for the A.O.H., Rutland Square; A. Scott, architect, 49, Upper O'Connell Street, Dublin.

DUDLEY.—Proposed new St. John's Church and vicarage (£9,000); Right Rev. the Lord Bishop of Worcester, Hartlebury Castle, Kidderminster.

DUNDEE.—Workshop, Ward Road, for the Dundee Water Commissioners. Alterations to property in West Henderson's Wynd, for A. Thomson & Sons.

ELLAND.—New church; Pastor, Southgate United Methodist Church, Elland.

FLEETWOOD.—Proposed drill hall in Bold Street, for the West Lancs. Territorial Force Association; Col. J. A. Edelsten, V.D., Secretary to the Association, 21, Islington, Liverpool.

GATESHEAD.—New church at Low Fell; Rev. A. Simmons, pastor, Low Fell Presbyterian Church, Gateshead.

GLASGOW.—Contemplated new training college (for 1,200 students) at Jordanhill, with demonstration school and hostel accommodation; Rev. Dr. J. Smith, Glasgow Provincial Committee, care of Royal Technical College.

HALIFAX.—Club house for the West End Golf Club (£2,000); C. Fox, 7, Rawson Street, Halifax.

HANDSWORTH.—Tramcar sheds; Harrison & Cox, architects, 109, Colmore Row, Birmingham.

HARROGATE.—Alterations, &c., to Christ Church Schools; Rev. D. S. Guy. Alterations to premises, King's Arcade, for J. W. Close. Alterations to premises, Montpellier Parade; G. R. Leach, architect. Additions and new motor garage, for the directors of the Grand Hotel Co., Ltd.

HORSHAM.—Two schools, New Street; W. Sussex, architect, Education Offices, Horsham.

HOWDEN (near GOOLE).—Proposed new Wesleyan Sunday School premises; Rev. P. Callier, Wesleyan minister.

HUNGERFORD.—Extensions to Wallingtons, Kintbury (£8,000); H. Freyberg, architect, 24, Cromwell Place, Kensington, S.W.

IFIELD (near CRAWLEY).—Proposed new school (450 places), for the West Sussex C.C.; County Architect, Horsham.

IRVINE.—Conversion of the old Artillery Drill Hall, West Road, into billiard hall, for A. Strang, Princess Street, Kilmarnock.

KINGSTON-UPON-THAMES.—Proposed new church (£2,200), for the Primitive Methodist Trustees.

LARGS (N.B.).—Children's Home; P. Caldwell, architect, Largs.

LEIGH.—Mill, for Taylor & Sons, cotton goods manufacturers; Bradshaw and Gass, architects, 19, Silverwell Street, Bolton.

LEITH.—U.F. church hall; G. Craig, architect, 85, Duke Street, Leith.

LEOMINSTER.—Proposed new drill hall, near the Territorial premises in New Street; Col. C. K. Wood, Secretary, County Territorial Force Association, The Barracks, Hereford.

LINCOLN.—Proposed abattoir buildings; R. A. MacBrair, Surveyor, Town Hall, Lincoln.

LIVERPOOL.—Proposed new Council school in Netherfield Road South (1,000 places); J. G. Legge, Director of Education, Education Offices, Sir Thomas Street, Liverpool.

LONDON (W.).—Business and residential building; F. W. Pelham-Palgrave, surveyor, 8, Argyll Place, W.

(HOLBORN, W.C.).—Business premises, Queen Street; Bird and Walters, architects, 64, Seymour Place, W.

MALTBY.—Proposed new police station for the West Riding Standing Joint Committee; County Architect, County Hall, Wakefield.

MANCHESTER.—Proposed girls' school adjoining Alfred Street School, Harpurhey (£2,000); C. H. Wyatt, Director of Education, Education Offices, Deansgate, Manchester. Prospective rebuilding, after fire, of oil and tallow works, for H. Green & Son, Pump Street.

MANSFIELD.—Proposed new church in Nottingham Road (£5,520); Pastor Clarkson Street United Methodist Church.

NEWCASTLE-ON-TYNE.—Large clubhouse at Gosforth Park, for the Northumberland Golf Club; D. Hill (Graham & Hill, architects), 6, Eldon Square, Newcastle-on-Tyne.

NEWLYN.—School; H. Maddern, architect, Morrab Road, Penzance.

NEWPORT (MON.).—Schools for defective children (£4,000); J. Bain, architect, Shire Hall, Newport.

NEWPORT (ISLE OF WIGHT.—Semi-detached villas, Cypress Road; T. and E. W. Jenkins, builders, Upper St. James's Street, Newport. Residence, Scotland Corner, Godshill; D. M. Morris, builder, Glengarnock, Godshill.

NORFOLK.—Alterations and additions to Dedlington Hall (£25,000); Dunn and Watson, architects, 35, Lincoln's Inn Fields, W.C.

NORWICH.—Additions to East Anglian Institute for Blind and Deaf Children (£2,175), for the Governors.

NOTTINGHAM.—Probable re-erection, after fire, of factory, Stanford Street, for J. M. Perry & Co., Ltd., apron and pinafore manufacturers (damage several thousand pounds).

OLDHAM.—Extensive alterations to business premises, 25 and 27, Manchester Street, for Mr. Phillips, fancy goods dealer.

ONGAR.—Alterations at workhouse; A. Richardson, Clerk, Guardians' Offices, High Ongar.

PETERBOROUGH.—New business premises in Midgate, for T. L. Barrett, draper, Midgate. Motor-omnibus depôt, Lincoln Road, for the Peterborough Tramway Co.

PONTARDAWE.—Probable re-erection, after fire, of Tawr Printing Works, Holly Street, for T. O. Jones (damage about £1,000). New offices at the works of W. Gilbertson & Co., Ltd., steel and tinplate manufacturers; J. C. Rees, architect, Parade Chambers, Neath.

RAINHAM (KENT).—Cement factory; P. L. Spoor, Rede Court, near Rochester.

ROCHDALE.—Contemplated additional Sunday school accommodation; Vicar of St. Clements.

SADDLEWORTH (near OLDHAM).—Housing scheme (300 houses); Surveyor to U.D.C.

ST. HELENS.—Proposed new school in connection with the Welsh Presbyterian Church, St. Helens Junction; Rev. J. P. Jones, Pastor, 77, Hardshaw Street, St. Helens. Contemplated rescue station; Secretary, Lancashire and Cheshire Coalowners' Association.

SCARBOROUGH.—Proposed harbour improvement and extension scheme; J. Barron, civil engineer, 214, Union Street, Aberdeen. Proposed structural alterations at the Londesborough Theatre and new café; (new company being formed.)

SEDGEFIELD.—Hospital; J. Stones, Surveyor, Council Offices, Sedgefield.

SLOUGH.—Additions to factory, for Horlick's Malted Milk Co., Ltd., infants' food, &c., manufacturers.

SOUTHAMPTON.—Works, Western Shore, for Pirelli, Ltd., manufacturers of electric cable, &c., 45, Basinghall Street, London, E.C.

SOUTHMINSTER (ESSEX).—Re-erection, after fire, of motor works (lit by electricity), North Street, for the Southminster Motor and Cycle Co.; W. H. Nix, manager (damage £1,000).

SOUTH SHIELDS.—Picture hall; J. H. Morton & Sons, architects, N.E. Bank Chambers, South Shields.

STIRLING.—Home (£2,500); J. Allan, architect, 32, Dumbarton Street, Stirling.

STOKE-ON-TRENT.—Proposed Church of England Boys' School, &c. (£5,000); Rev. C. R. Cotter, Vicar of Fenton, Stoke-on Trent. Proposed school for girls; W. L. Copeland, Education Offices, Stoke.

STOWMARKET.—Additions to Sir Robert Hitcham Girls' School, Debenham; R. G. Fordham, architect, 2, Bolton Villas, Sidegate Lane, Ipswich.

STUDLEY.—School; J. Willmott, architect, 6, Waterloo Street, Birmingham.

SUNDERLAND.—Proposed hall; Wright & Chapman, architects, 38, Grainger Street, Newcastle. Extensions to works, for Lynn & Co., winch manufacturers; W. & T. R. Milburn, architects, 20, Fawcett Street, Sunderland.

SWANSEA.—New Congregational Church at Pentrechwyth; Rev. J. T. Rogers, Congregational Minister.

TARBOLTON.—School (£6,000); J. & H. V. Eaglesham, architects, Wellington Chambers, Ayr.

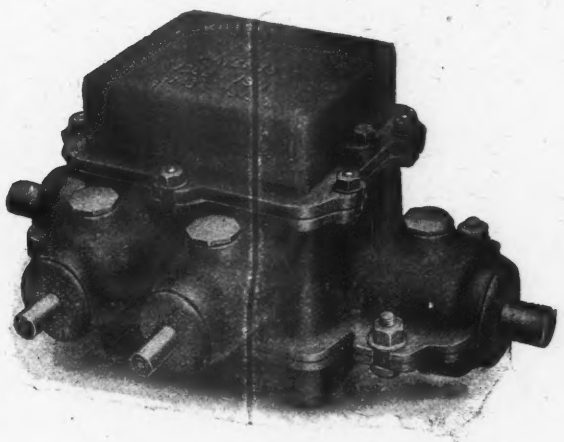
WAKEFIELD.—Proposed new St. Michael's Church, in Alverthorpe Road, Alverthorpe; Rev. T. H. Bywater, Rural Dean. Phthisis hospital (£1,500); Board of Guardians.

WALLSEND.—Sixty-six houses, near Rising Sun Colliery, for the Wallsend and Hebburn Coal Co., Ltd., Exchange Buildings, Newcastle-on-Tyne.

(*Continued on page* xxvi.)

DICKINSON'S PATENT COVER

PATENT Nos. 1302 and 5745/11.



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DUBLIN—17, Crow Street. BELFAST—11, Queen Street.

CONTRACTORS' COLUMN.—*Continued from page* xxiv.

WALSALL.—Proposed new post office, for H.M. Office of Works; C. S. Covington, Postmaster, Walsall. Proposed new St. Peter's Boys' School (£2,000); Rev. C. E. McCreery, Vicar of St. Peter's. Additions to the Blue Coat School (£1,000), for the Managers.

WELLINGBOROUGH.—Isolation hospital; Sharman & Archer, architects, 32A, Sheep Street, Wellingborough. Buildings for London City and Midland Bank; T. B. Whinney, architect, 8, Old Jewry, E.C.

WEYMOUTH.—Alterations to bottling store, Lower Bond Street; Crickmay and Son, architects, 49, St. Mary Street, Weymouth. Alterations to London Hotel: S. Jackson, architect, Bridge Chambers, Weymouth.

WHITBY.—Additions to Raithwaite Hall; H. G. Walker, architect, Golden Lion Bank, Whitby. Alterations and additions to the Royal Hotel; the Proprietor. Proposed sewerage and sewage disposal works at Sleights; G. Buchanan, Surveyor to R.D.C.

WYKE (BRADFORD).—Weaving shed at Norwood Green, near Wyke; Moore and Crabtree, architects, York Chambers, Keighley.

YORK.—Alterations to business premises, 22, Coney Street, for J. Grisdale, ladies' tailor and furrier. Proposed extension of the tramway depôt, near Fulford Road; Tramways Manager. Proposed school for defectives; Secretary, City Education Commitee.

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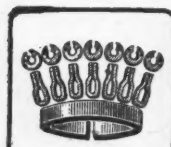

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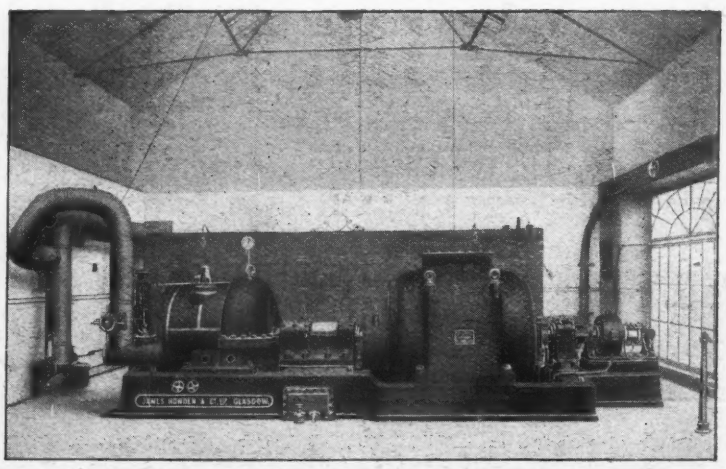

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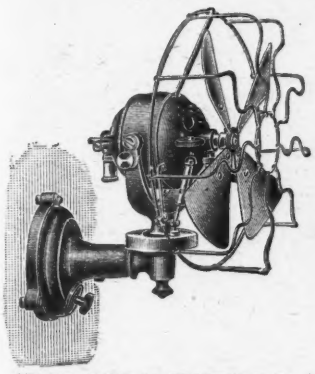

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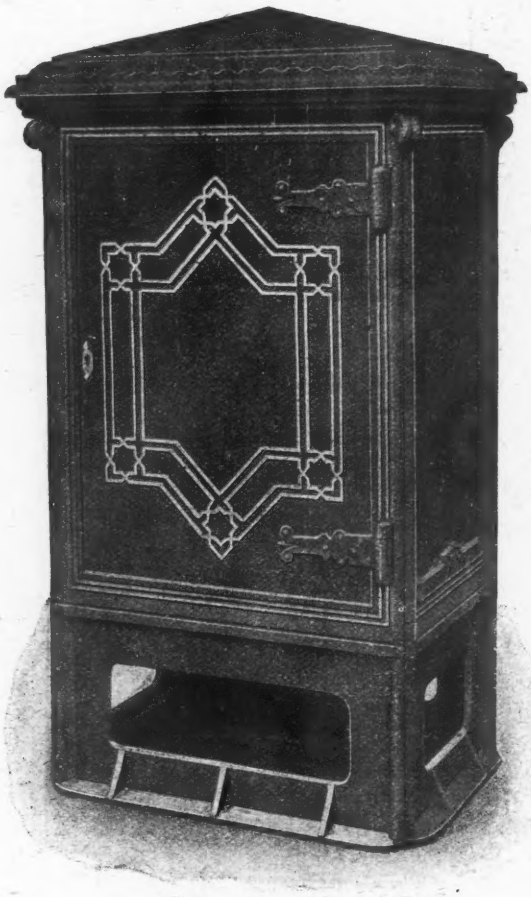

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,, 1b ...	21 × 12 ins. ...	33 × 17 ins.
,, 2 ...	21 × 14 ins. ...	33 × 17 ins.
,, 2a ...	21 × 16 ins. ...	33 × 17 ins.
,, 2c ...	21 × 18 ins. ...	33 × 17 ins.
,, 2b ...	25 × 14 ins. ...	36 × 21 ins.
,, 3 ...	25 × 16 ins. ...	36 × 21 ins.
,, 3a ...	25 × 20 ins. ...	36 × 21 ins.
,, 3b ...	31 × 16 ins. ...	36 × 27 ins.
,, 4 ...	31 × 20 ins. ...	36 × 27 ins.
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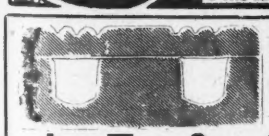
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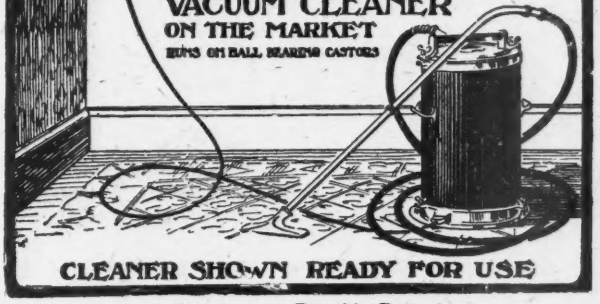
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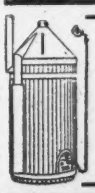
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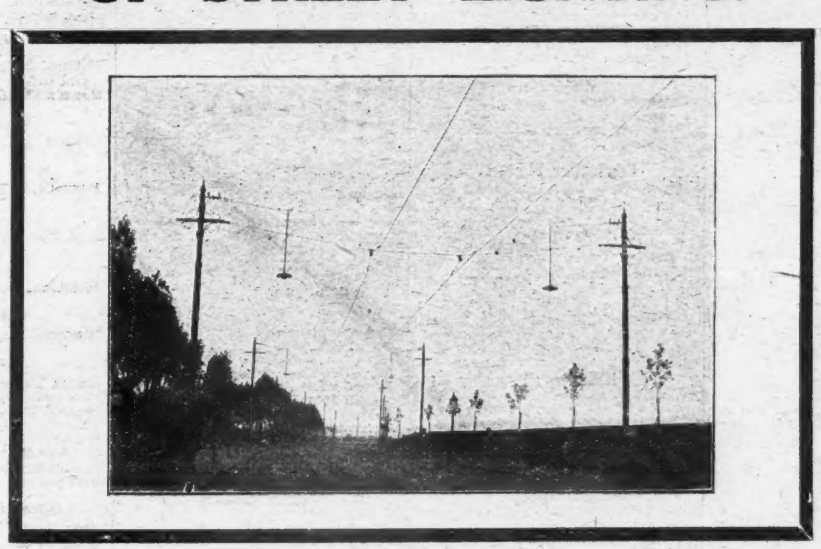

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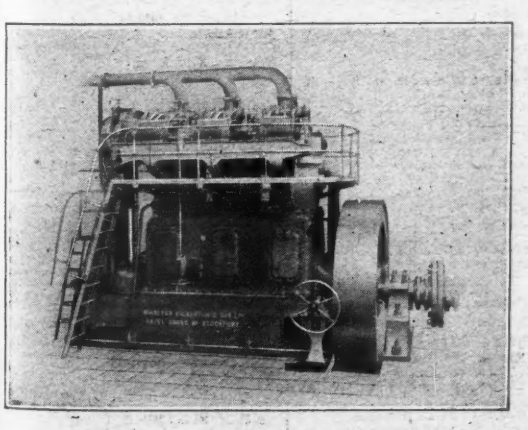

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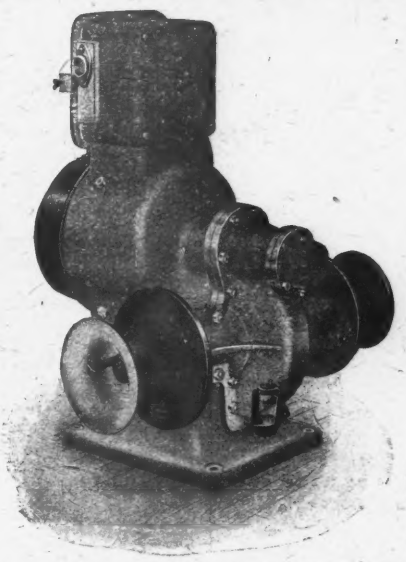

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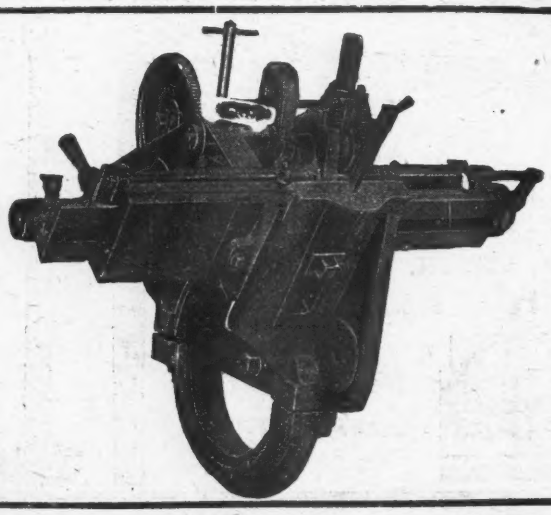

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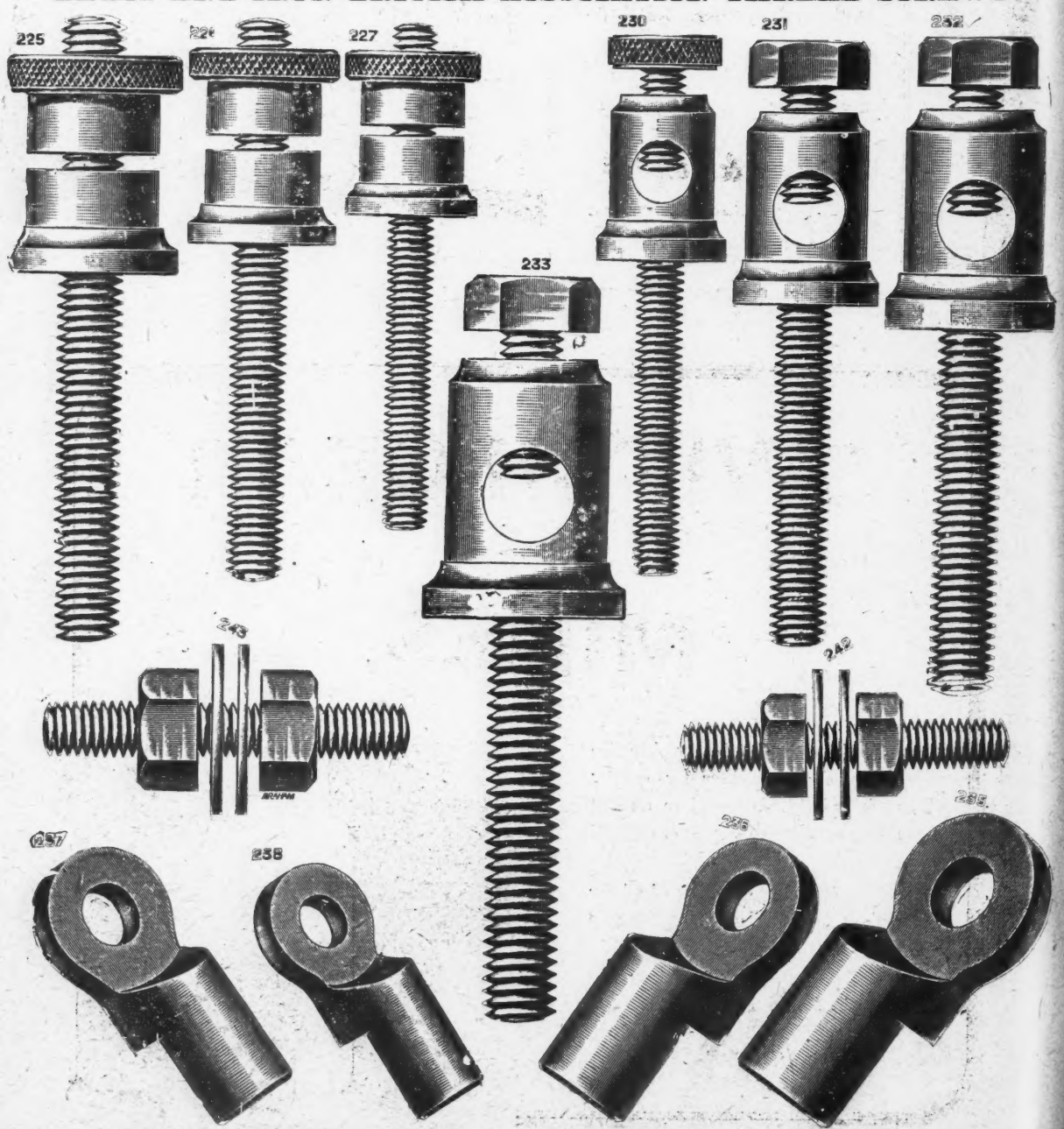

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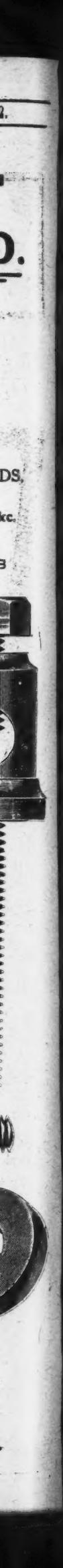

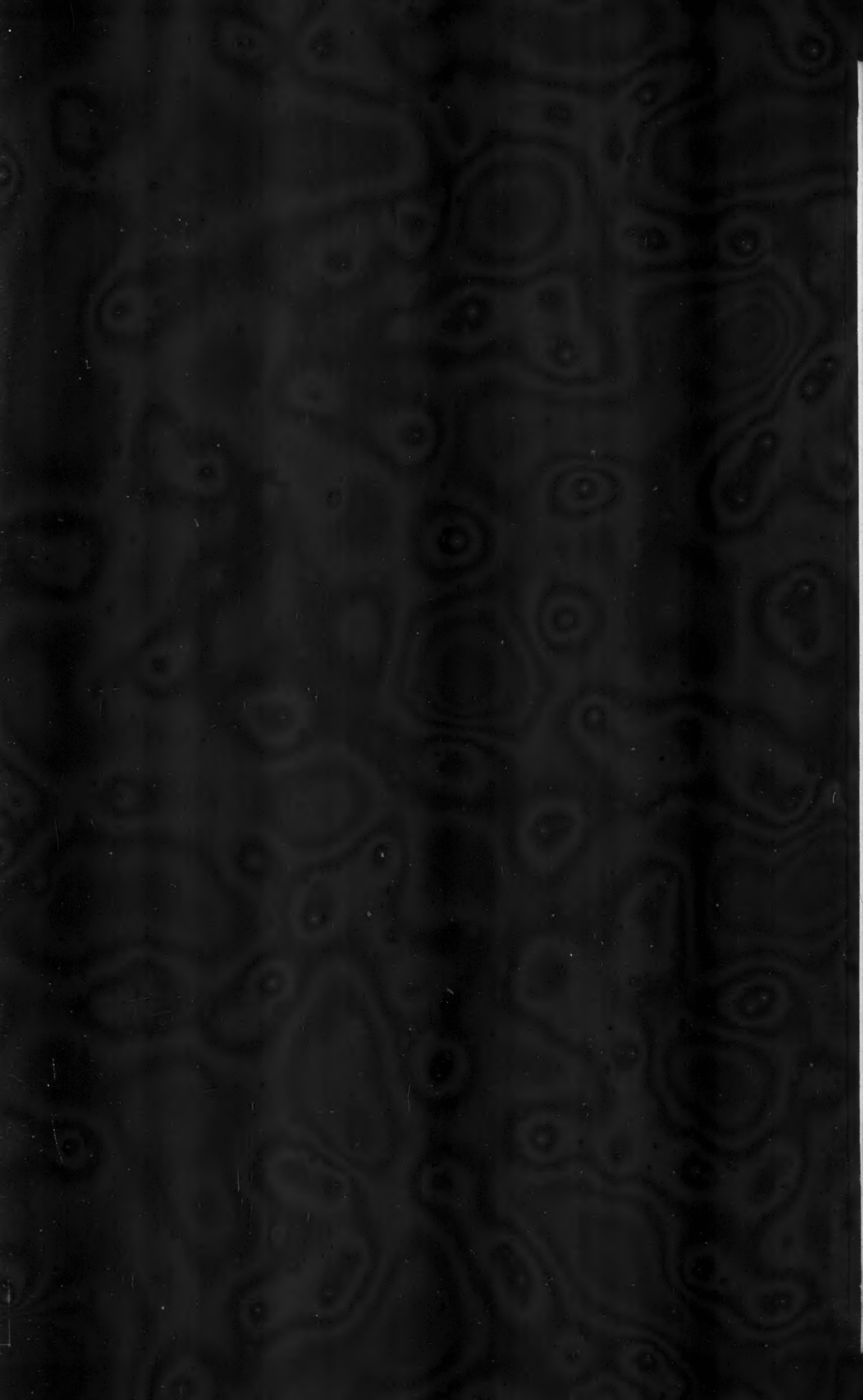

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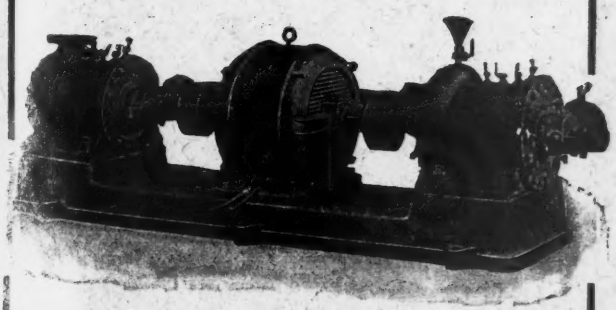

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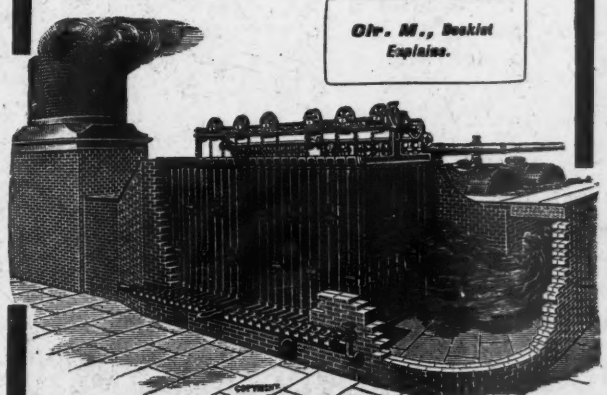

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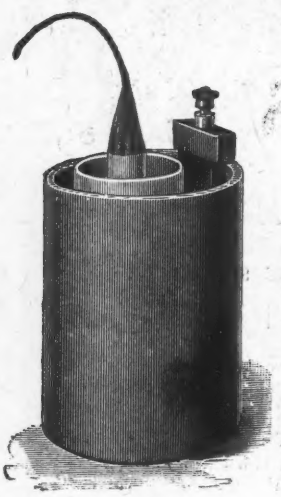

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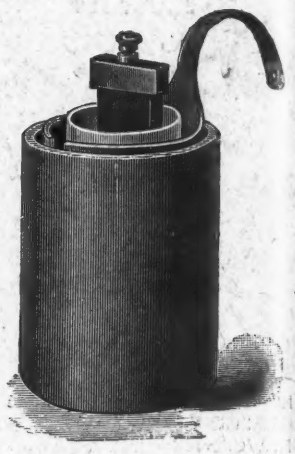

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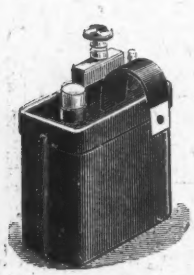

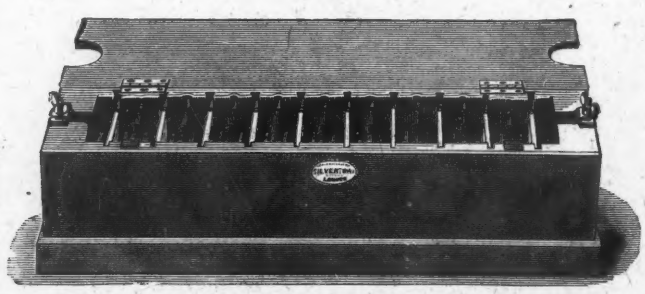

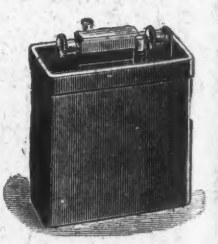

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